Bangalore Development Authority

T.Chowdaiah R oad, Kumara Park West, Bangalore-560 020

Restoration and Rejuvenation to Bengaluru Hasi Karaga Temple, Kalyani And Construction of Conventions Center Beside Kanteerava Stadium

FIRST ELECTRONIC DOCUMENT

(TECHNICAL BID DOCUMENT)

Bangalore Development Authority
T.Chowdaiah road, Kumara Park West, Bangalore-560 020

Telephones : +91 8861083656

TENDER FOR

Restoration and Rejuvenation to Bengaluru Hasi Karaga Temple, Kalyani And Construction of Conventions Center Beside Kanteerava Stadium

Tender reference	:	BDA/2024-25/BD/WORK_INDENT59
Last date and Time for receipt of Queries	:	Refer Karnataka Public Procurement
PortalDate and Time of Pre-tender meeting	:	Refer Karnataka Public Procurement
PortalPlace of Pre-tender meeting	:	Office of the Engineer Member Bangalore Development Authority T.Chowdaiah road, Kumarapark WestBengaluru- 560 020
Last date and time for receipt of tender	:	Refer Karnataka Public Procurement Portal
Time and date of opening of First Electronic Document (Technical Bid Document)	:	Refer Karnataka Public Procurement Portal
Place of opening of First Electronic Document	:	Office of the Executive Engineer Infrastructure Division Bangalore Development Authority T.Chowdaiah road, Kumarapark West Bengaluru-560 020
Time and date of opening of Second Electronic Document (Financial Bid Document)	:	Will be intimated to the qualified tenderers
Place of opening of Second Electronic Document	:	Will be intimated to the qualified tenderers
Address for communication	:	Office of the Executive Engineer Infrastructure Division Bangalore Development Authority T.Chowdaiah road, Kumarapark West Bengaluru-560 020

Contents

Section No.	Description	Page
1	Invitation for Tenders (IFT)	4
2	Instructions to Tenderers (ITT)	6
3	Qualification Information	19
4	Form of Tender, Letter of Acceptance, Notice to proceed with the work and Agreement Form	23
5	Conditions of Contract (CC)	26
6	Contract Data	43
7	Specifications	45
8	Drawings	49
9	Bill of Quantities	50
10	Format of Bank Guarantee for Security Deposit	51
11	Format of Bank Guarantee for Earnest Money Deposit	52

SECTION 1 :Invitation for Tenders (IFT)

Bangalore Development Authority

T.Chowdaiah road, Kumara Park West, Bangalore-560 020

BDA/2024-25/BD/WORK_INDENT

Office of the Executive Engineer
Infrastructure Division
Bangalore Development Authority
Bangalore.

1. The Executive Engineer, Infrastructure Division, Bangalore Development Authority, Bangalore (BDA), on behalf of the Commissioner, Bangalore Development Authority, Bangalore, invites tenders from eligible tenderers, for the works detailed in the Table. Two Tender Document System as per Rule 28 of the KTPP Act shall be followed. The Tenderers are required simultaneously submit two separate electronic document, first containing the Earnest money deposit and the details of their capability to undertake the tender (as detailed in ITT Clause 2 and 3), which will be opened first and the second containing the price tender (as detailed in Section4 and 9) which will be opened only if the Tenderer is found to be qualified to execute the tendered works. The Tenderers are advised to note the minimum qualification criteria specified in Clause 3 of the Instructions to Tenderers to qualify for award of the contract.

2. Tender documents shall be available for down load free of cost from the date and time of publication of the tenders on the Government of Karnataka, Karnataka Public Procurement Portal (https://kppp.karnataka.gov.in) till the last date and time or the extended time of submission specified on the Karnataka Public Procurement Portal. Interested tenderers may obtain further information at the Office of the Executive Engineer, Infrastructure Division, Bangalore Development Authority, T.Chowdaiah road, Kumara Park West, Bengaluru-560 020.

3. Tenders must be accompanied by Earnest Money Deposit and a non-refundable Tender processing fee specified for the work in the Table below. Earnest money deposit and Tender processing fee will have to be in any one of the forms as specified in the tender document.

4. Tenders must be uploaded on Government of Karnataka, Karnataka Public Procurement Portal (https://kppp.karnataka.gov.in) on or before the last date and time specified on the Karnataka Public Procurement Portal, so as to be received by the Employer and First Electronic Document will be opened on the date and time specified in the Karnataka Public Procurement Portal, without requiring the presence of tenderers or in the presence of Tenderers or in the presence of the Tenderers' representatives, who wish to attend at Office of the Executive Engineer, Infrastructure Division, Bangalore Development Authority, T.Chowdaiah road, Kumara Park West, Bengaluru-560 020. If the office happens to be closed on the date of opening of the tenders as specified, the tenders will be opened on the next working day at the same time and venue.

5. A Pre-tender meeting will be held on the time, date and address, as specified on the Karnataka Public Procurement Portal at Office of the Engineer Member, Bangalore Development Authority, T.Chowdaiah Road, Kumara Park West, Bangalore-560 020, to clarify the issues if any, and to answer questions on any matter that may be raised at that stage as stated in Clause 8 of 'Instructions to Tenderers' of the tender document.

6. All duties, taxes, and other levies payable by the contractor under the contract, or for any other cause, shall be included in the rates except Goods and Service tax (GST), submitted by the Tenderer. GST will be reimbursed by the Employer at the prevailing rates to the Bill amount, and as amended from time to time. No enquiries or requests will be entertained later by this office. (Refer Government Circular FD 417 EXP-12 2024 dated 09-08-2024).

6. Other details can be seen in the tender documents.

TABLE

Sl No	Name of work	Approximate value of work (Rs. in Lakhs)	Earnest Money Deposit (Rs. in Lakhs)	Tender processing fee (Rs.)	Period of completion
1	Restoration And Rejuvenation To Bengaluru Hasi Karaga Temple, Kalyani And Construction of Conventions Center Beside Kanteerava Stadium	563.50	8.45	Refer Karnataka Public Procurement Portal	11 months

Sd/-
Executive Engineer
Infrastructure Division
Bangalore Development Authority
Bangalore.

SECTION 2 :Instruction to Tenderers (ITT)

Table of Clauses

A General
1 Scope of Tender
2 Eligible Tenderers
3 Qualification of the Tenderer
4 One Tender per Tenderer
5 Cost of Tendering
6 Site Visit

B Tender Documents
7 Content of Tender Documents
8 Clarification of Tender Documents
9 Amendment of Tender Documents

C Preparation of Tenders
10 Documents comprising the Tender
11 Tender Prices
12 Tender Validity
13 Earnest Money Deposit
14 Format and Signing of Tender

D Submission of Tenders
15 Sealing and marking of Tenders
16 Deadline for submission of Tenders
17 Late Tenders
18 Modification and Withdrawal of Tenders

E Tender opening and evaluation
19 Opening of First Electronic Document of all Tenders and evaluation to determine qualified Tenderers
20 Opening of Second Electronic Document Tenders of qualified Tenders and evaluation
21 Process to be confidential
22 Clarification of Tendres
23 Examination of Tenders and determination of responsiveness
24 Correction of errors
25 Evaluation and comparison of Tenders

F Award of contract
26 Award criteria
27 Employer's right to accept any Tender and to reject any or all Tenders
28 Notification of award and signing of Agreement
29 Security deposit
30 Advance payment and Security
31 Corrupt or Fraudulent Practices

Instruction To Tenderers (ITT)

A General

1 Scope of Tender

1.1 The Executive Engineer, Infrastructure Division, Bangalore Development Authority, Bangalore, on behalf of the Commissioner, Bangalore Development Authority, Bangalore (Referred to as Employer in these documents) invites tenders following Two Tender Document System, from eligible Tenderers, for the works (as defined in these documents and referred to as "the works") detailed in the Table given in the Invitation for Tenders (IFT). The Tenderers may submit tenders for any or all of the works detailed in the table given in IFT.

2 Eligible Tenderers

2.1 Tenderers shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the Government of Karnataka.

2.2 **Tenders from Joint ventures are not acceptable**.

2.3 (i) Any Registered Tenderer, individual, Firm / Agency / Partnership firm / Company / Class-III and above Contractor Registered in KPWD or Public Sector undertaking having suitable Technical, Financial and Managerial capabilities satisfying the following conditions are eligible to apply.

(ii) The Tenderers shall have Memorandum of Article of Association and Power of Attorney, authorizing the signatory, as the case may be.

(iii) The letter of authorization by the Tenderer of a person or persons duly authorized to bind the tenderer to the Contract shall be indicated by written power-of-attorney, as the case may be.

(iv) The Tenderer shall have enrolled with Income Tax Department and should furnish copy of PAN Card issued under Income Tax Rules.

(v) The Tenderer shall have enrolled under Goods and Service Tax Rules and should furnish copy of Goods and Service Tax Certificate issued under Goods and Service Tax Rules.

(vi) The Tenderers shall have enrolled in Labour department, issued by State / Central Government under labour Act and valid till the completion of the contract.

(vii) The Tenderers shall have enrolled under Provident Fund Registration Certificate (PF).

(viii) Provident Fund last paid challan.

(ix) The Tenderers shall have enrolled under Employers State Insurance Registration Certificate (ESI).

(x) Information required as stated, and as per proforma suggested in Section 3.

3 Qualification of the Tenderer

3.1 All Tenderers shall provide the requested information accurately and in sufficient detail in Section 3: Qualification information.

3.2 To qualify for award of this contract, each Tenderer in its name should have in the last five years i.e.2019-2020 to 2023-2024):

(a) achieved in at least two financial years a minimum financial turnover (in all classes of civil engineering construction works only) of Rs. 1127.00 lakh;

(b) mandating satisfactory completion as prime contractor, for at least one similar work such as Construction of Building, parks and playground, and other allied works, of value not less than Rs. 282.00 lakh;

(c) executed in any one year, the following minimum quantities of work :

Sl No	Description of item	Unit	Quantity
1	Earthwork excavation	cum	850
2	Size stone masonry	cum	301
3	Cement concrete	cum	875
4	TMT	MT	112
5	Solid Concrete blocks / Brick masonry	Sqm	855
6	Plastering	cum	3990
7	Vitrified / Granite flooring	Sqm	1400
8	Paver Blocks	Sqm	1000

(d) Deleted.

(e) Deleted.

3.3 Each Tenderer should further demonstrate :

(a) Deleted.

(b) liquid assets and / or availability of credit facilities of no less than Rs. 153.55 lakh (Credit lines/ letter of credit/ certificates) from Nationalized / Scheduled banks for meeting the fund requirement etc.

3.4 Deleted**.**

3.5 Sub-contractors' experience and resources shall not be taken into account in determining the Tenderer's compliance with the qualifying criteria except to the extent stated in 3.2(d) and (e) above.

3.6 Tenderers who meet the above specified minimum qualifying criteria, will only be qualified, if their available tender capacity is more than the total tender value. The available tender capacity will be calculated as under:

Assessed available tender capacity = (A*N*1.5 - B)

Where

A = Maximum value of civil engineering works executed in any one year during the last five years (*updated to 2024-2025 price level*) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the works for which tenders are invited.

B = Value, at 2024-2025 price level, of existing commitments and on-going works to be completed during the next 12 months.

Note : *The statements showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Employer in charge, not below the rank of an Executive Engineer or by the Chartered Accountant (CA) of the tenderer, supported with Work Order and latest audited RA bill of the respective works listed in the Statement. (GO No. FD 6 PCL 2006 Bangalore dated 21-03-2007).*

The tenderer should provide an Affidavit swearing to the effect that the stated works are the only works and it is true to the best of his / her / their knowledge.

The Financial bid of those Tenderers who fulfill the eligibility criteria and qualification information, shall be opened.

3.7 Even though the Tenderers meet the above criteria, they are subject to be disqualified if they have:

- made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or;
- record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.; and/or;

- participated in the previous Tender for the same work and had quoted unreasonably high tender prices and could not furnish rational justification.

4 One Tender per Tenderer

4.1 Each tenderer shall submit only one tender for one package. A tenderer who submits or participates in more than one Tender (other than as a sub-contractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the Tenderer's participation to be disqualified.

5 Cost of Tendering

5.1 The tenderer shall bear all costs associated with the preparation and submission of his tender, and the Employer will in no case be responsible and liable for those costs.

6 Site visit

6.1 The Tenderer at his own responsibility and risk is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Tender and entering into a contract for construction of the Works. The cost of visiting the Site shall be at the Tenderer's own expense.

B Tender Documents

7 Content of Tender Documents

7.1 The set of tender documents shall have all the Sections given in Page 2.
7.2 Deleted.

8 Clarification of Tender Documents

8.1 A prospective tenderer requiring any clarification of the tender documents may notify the Employer on Karnataka Public Procurement Portal. The Employer will respond to any request for clarification which he receives not later than the time and date, as specified on the Karnataka Public Procurement Portal, prior to the deadline for submission of tender. Employer's response will be notified on Karnataka Public Procurement Portal, including a description of the enquiry but without identifying its source.

8.2 Pre-tender meeting :

Deleted.

8.2.1 The tenderer or his authorized representative is invited to attend a pre-tender meeting which will take place at the address time and date as specified on Karnataka Public Procurement Portal.

8.2.2 The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

8.2.3 The tenderer is requested to submit any questions in writing on Karnataka Public Procurement Portal to reach the Employer not later than the time and date, as specified on the Karnataka Public Procurement Portal.

8.2.4 Minutes of the meeting, including the text of the questions raised (without identifying the source of enquiry) and the responses given will be notified on Karnataka Public Procurement Portal. Any modification of the tender documents listed in Sub-Clause 7.1 which may become necessary as a result of the pre-tender meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause 9 and not through the minutes of the pre-tender meeting.

8.2.5 Non-attendance at the pre-tender meeting will not be a cause for disqualification of a tenderer.

9 Amendment of Tender Documents

9.1 Before the deadline for submission of tenders, the Employer may modify the tender documents by issuing addenda.

9.2 Any addendum thus issued shall be part of the tender documents and shall be notified on Karnataka Public Procurement Portal.

9.3 To give prospective Tenderers reasonable time in which to take an addendum into account in preparing their tenders, the Employer shall extend as necessary the deadline for submission of tenders, in accordance with Sub-Clause 16.2 below.

C Preparation of Tenders

10 Documents Comprising the Tender

10.1 The tender uploaded by the Tenderer shall be intwo electronic documents and shall contain the documents as follows :

10.1.1 First Electronic Document:

(a) Earnest Money Deposit and Tender processing fee;

(b) Eligibility criteria as per Clause 2 of ITT and Qualification Information as per Clause 3 of ITT and as per formats given in Section 3.

10.1.2 Second Electronic Document :

(a) The Tender (in the format indicated in Section 4);

(b) Priced Bill of Quantities (Section 9).

and any other materials required to be completed and submitted by Tenderer in accordance with these instructions. The documents listed under Sections 3, 4, 9 shall be filled in without exception.

10.2 Tenderer submitting tenders together with other contracts stated in the IFT to form a package will so indicate in the tender together with any discounts offered for the award of more than one contract.

11 Tender Prices

11.1 The contract shall be for the whole works as described in Sub-Clause 1.1, based on the priced Bill of Quantities submitted by the Tenderer.

11.2 The Tenderer shall fill in rates for all items of the Works described in the Bill of Quantities. The line item total along with total tender price will be auto generated in electronic tendering system. **Items for which no rate is entered by the Tenderer will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities**.

11.3 All duties, taxes, and other levies payable by the contractor under the contract, or for any other cause, shall be included in the rates except Goods and Service tax (GST), submitted by the Tenderer. GST will be reimbursed by the Employer at the prevailing rates to the Bill amount, and as amended from time to time. No enquiries or requests will be entertained later by this office. (Refer Government Circular FD 417 EXP-12 2024 dated 09-08-2024).

11.4 The rates and prices quoted by the Tenderer shall be subject to adjustment during the performance of the Contract in accordance with the provisions of Clause of the Conditions of Contract.

11.5 The Tenderer shall fill in labour rates not below the minimum wages prescribed by all existing labour Enactments and Rules made there under, Regulations, Notifications and Bye laws including amendments that may be issued under any labour law (including Rules), either by the Central Government or the State Government or the Local Authority. Wherever labourers are engaged in executing items proposed, where labour rates are not specifically mentioned to quote as per the number of labourers required in executing the items, the labour rates shall be paid as above.

12 Tender validity

12.1 Tenders shall remain valid for a period not less than ninety days after the deadline date for tender submission specified in Clause 16. A tender valid for a shorter period shall be rejected by the Employer as non-responsive.

12.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the Tenderers may extend the period of validity for a specified additional period. The request and the Tenderers' responses shall be made in writing or by cable. A Tenderer may refuse the request without forfeiting his earnest money deposit. A Tenderer agreeing to the request will not be required or permitted to modify his tender, but will be required to extend the validity of his Earnest money deposit for a period of extension, and in compliance with Clause 13 in all respects.

13 Earnest money deposit and Tender processing fee

13.1 The Tenderer shall furnish, as part of his tender, earnest money deposit in the amount as shown in column 4 and non-refundable tender processing fee in the amount as shown in column 5 of the Table of IFT for this particular work.

EMD shall be paid in total through e-payment or minimum of Rs.1.00 lakh shall be paid through e-payment and the balance EMD shall be through Bank Guarantee in the form given in Section11 from any Nationalized / Schedule bank or through e-bank guarantee, obtained after the date of notification of tender and on or before the last date for submission of tender, payable at Bangalore, in favour of the Employer. A scanned copy of the Bank Guarantee shall be uploaded at the appropriate place provided in Karnataka Public Procurement Portal along with the First Electronic Document (Technical Bid Document), failing which the bids will be rejected in the Karnataka Public Procurement Portal. The original Bank guarantee shall be submitted to the Office of the Executive Engineer, Infrastructure Division, Bangalore Development Authority, T.Chowdaiah road, Kumara Park West, Bengaluru-560 020, on or before the Time and date of opening of First Electronic Document (Technical Bid Document), in person or through authorized representative, failing which the Bank Guarantee shall be rejected by the Employer as non-responsive in the Karnataka Public Procurement Portal.

The Employer or representative will open the tender of the Tenders received in Karnataka Public Procurement Portal at Office of the Executive Engineer, Infrastructure Division, Bangalore Development Authority, T.Chowdaiah road, Kumara Park West, Bengaluru-560 020, at the designated date and time, without requiring the presence of Tenderer or in the presence of the Tenderers or their authorized representatives who choose to attend. In the event of the designated date of the Tenders opening being declared a holiday for the Employer, the Tenders will be opened at the designated time and location on the next working day. The Tenderers or their authorized representatives who are present shall sign a register evidencing their attendance.

The uploaded scanned copy of Bank guarantee shall be downloaded by the Employer. The downloaded copy of Bank guarantee shall be compared with the original Bank guarantee submitted by the tenderer. Upon comparison, if the correctness of the Bank Guarantee is found satisfactory, the Bank guarantee will be accepted and the First Electronic Document (Technical Bid Document) shall be opened. If the Bank Guarantee is not in order, and the non-receipt of the original Bank guarantee shall be rejected by the Employer as non-responsive in the Karnataka Public Procurement Portal. The First Electronic Document (Technical Bid Document) shall be opened in respect of such tenderer who have paid EMD in full though e-payment or who have paid part of EMD though e-payment and balance EMD through Bank Guarantee shall be considered for evaluation. The confirmation letter shall be addressed to the respective Bank authorities, with a return letter for the confirmation of Bank Guarantee within seven days. Upon receipt of confirmation letter from the respective Bank authorities, the Bank Guarantee shall be accepted and evaluation will be processed. Non-receipt or delay in confirmation of Bank Guarantee by the respective Bank authorities within the stipulated period,

result in rejection of Bank Guarantee and the tender of such tenderer's treated as non-responsive and also withdrawn in the evaluation process. The original Bank Guarantee shall be returned and subsequently part payment of EMD shall also be returned.

The tenderers participating in the First Electronic Document (Technical Bid Document), who indulges in fraudulent, malpractices and non-submission of proper Bank Guarantee during opening of the First Electronic Document (Technical Bid Document), the Employer shall take following action against such tenderers.

(i) Forfeiture of the initial amount deposited through e-payment by such contractors to the Employer; and

(ii) Initiate Black listing of such contractors so as to prevent them in participating in future tenders, if repeatedly resort malpractices.

The proposal shall be sent to the competent Registration authority and also initiate action as per Rule 26A and 26C of Karnataka Transparency in Public Procurements Rules, 2000 and as amended in respect of Debarment of Tenderers or Contractors.

This earnest money deposit and tender processing fee shall be in the form of e-payment can be paid on Karnataka Public Procurement Portal using any of the following online or offline modes of e-payment :

- **Credit card**
- **Direct Debit**
- **National Electronic Fund Transfer (NEFT)**
- **Over The Counter (OTC)**

National Electronic Fund Transfer (NEFT) payment procedure :

If a tenderer chooses to make payment of EMD / Tender processing fees using Reserve Bank of India's (RBI) National Electronic Fund Transfer (NEFT) system, the tenderer will need to log into Karnataka Public Procurement Portal (http://eproc.karnataka.gov.in), access the tender for which bid is being created and then select the NEFT option under the payment section and print the Challan shown in that section. The printed challan will have the unique bid reference number, account details of Government of Karnataka and the amount to be remitted. The contractor has to submit the printed challan to its bank branch (NEFTenabled) and request for an account-to-account transfer, wherein the money will get transferred from the tenderers' bank account to GoK's bank account. The tenderer should ensure that NEFT transfer instructions are executed and the funds are wired to the Government of Karnataka's principal account before the last date for bid submission and preferably 24 hours before the last date for bid submission. If the tenderer's bank transfers/wires the money after the last date for bid submission, the tenderer's bid will be liable for rejection. Upon executing the transfer, the tenderer's bank will provide a reference number generated by NEFT software as confirmation of transfer, which has to be inputted by tenderer in the payment section of its bid as payment confirmation before the bid is submitted (i.e.) as a pre-requisite for bid submission. Also, the account number from which the funds were transferred have to be inputted in the Karnataka Public Procurement Portal as part of its bid.

Over The Counter (OTC) payment procedure :

If a tenderer chooses to make payment of EMD / Tender processing fees Over The Counter (OTC) in any of the designated ICICI Bank Ltd branches listed on Karnataka Public Procurement Portal (http://eproc.karnataka.gov.in), the tenderer will need to log into Karnataka Public Procurement Portal, access the tender for which bid is being created and then select the

OTC option under the payment section and print the Challan shown in that section. The printed challan will have the unique bid reference number and the amount to be remitted. Along with the challan, tenderer can choose to make the payment either in the form of cash or in the form of Demand Draft. Cheque payments will not be accepted. The tenderer is requested to specifically inform the bank officer to input the unique bid reference number printed in the challan in the banking software. Upon successful receipt of the payment, the bank will provide a 16-digit reference number acknowledging the receipt of payment. This 16-digit reference number has to be inputted by tenderer in the payment section of its bid as payment confirmation before the bid is submitted (i.e.) as a pre-requisite for bid submission.

(a) EMD amount shall be submitted by the tenderer taking into account the following conditions:
    (i) EMD will be accepted only in the form of electronic cash (and not through Demand Draft or Bank Guarantee) and will be maintained in the Government of Karnataka central pooling account at ICICI Bank Ltd until the contract is closed.
    (ii) The entire EMD amount for a particular tender has to be paid in a single transaction.

(b) The tenderer's bid will be evaluated only on confirmation of receipt of the payment (EMD and Tender processing fee) as indicated in Sub-Clauses 13.1 (a) in the Government of Karnataka central pooling A/c held at ICICI Bank Ltd.

13.2 Instruments having fixed validity period issued as EMD (earnest money deposit) for tender shall be valid for 45 days beyond the validity of the tender.

13.3 Any tender not accompanied by an acceptable earnest money deposit and not secured as indicated in Sub-Clauses 13.1 above shall be rejected in Karnataka Public Procurement Portal as non-responsive.

13.4 The earnest money deposit of unsuccessful Tenderers will be returned within 30 days after the successful Tenderer has signed the Agreement, pursuant to ITT Clause 28, and furnished the required Performance Security, pursuant to ITT Clause 29.

13.5 The earnest money deposit of the successful Tenderer will be discharged when the Tenderer has signed the Agreement, pursuant to ITT Clause 28, and furnished the required Performance Security, pursuant to ITT Clause 29.

13.6 The earnest money deposit may be forfeited:

(a) if the Tenderer withdraws the Tender after tender opening during the period of tender validity;

(b) if the Tenderer does not accept the correction of the Tender Price, pursuant to Clause 24; or

(c) in the case of a successful Tenderer, if the Tenderer fails within the specified time limit to:
    (i) sign the Agreement; or
    (ii) furnish the required Security deposit.

(d) If the Tenderer who has engaged directly or through an agent in a corrupt or fraudulent practices in participating or competing or executing the contact including misleading the Employer at any stage of procurement and executing entity. Employer shall initiate action as per Rule 26A and 26C of Karnataka Transparency in Public Procurements Rules, 2000 and as amended in respect of Debarment of Tenderers or contractor or any of its successors.

14 Format and signing of Tender

14.1 The Tenderer shall prepare one original of the documents comprising the Tender as described in Clause 10 of these Instructions to Tenderers.

14.2 The Tenderer shall scan the original of the documents by converting into electronic document file in conventional, clear clarity visible form (preferably in pdf / jpg / bmp format) to upload on Karnataka Public Procurement Portal. The Tenderer shall fill in rate on the unit rate column for all the items of the work described in Bill of Quantities, generated separately by the Employer on Karnataka Public Procurement Portal. The tender prices and total tender price will be auto

generated in electronic tendering system. The letter of authorization by the Tenderer of a person or persons duly authorized to bind the tenderer to the Contract shall be indicated by written power-of-attorney accompanying the tender. Signing of tender is deemed as signed in electronic tendering system.

14.3 The Tender shall contain no alterations or additions, except those to comply with instructions issued by the Employer which is duly incorporated.

D Submission of Tenders

15 Sealing and Marking of Tenders

15.1 The Tenderer shall upload the electronic document file in the format as specified in Clause 14.2 of ITT at the relevant place provided on Karnataka Public Procurement Portal.

15.2 The Tenders are required simultaneously upload two separate electronic document, (i) First Electronic Document (Technical Bid Document) and (ii) Second Electronic Document (Bill of Quantities), so as to be received by the Employer.

(i) The First Electronic document shall contain :
   (a) Earnest Money Deposit and Tender processing fee as in Clause 13.1 of ITT;
   (b) Eligibility criteria : prescribed in Clause 2 of ITT; and
   (c) Qualification information described in Clause 3 of ITT, Proforma suggested and Information required as stated in Section 3.

   The First Electronic document shall not contain any financial information.

(ii) The Second Electronic document shall contain:
   (a) Form of tender; and
   (b) Bill of Quantities (BOQ).

15.3 Deleted.

15.4 Deleted.

15.5 It is the responsibility of the tenderer to upload all the respective required documents pertaining to Eligibility criteria, qualification information and Bill of Quantities with due diligence.

15.6 Telex, cable or facsimile tenders will be rejected.

15.7 No physical documents shall be considered.

16 Deadline for Submission of Tenders

16.1 Tenders must be received by the Employer at the address specified above no later than time and date as specified on Karnataka Public Procurement Portal.

16.2 The Employer may extend the deadline for submission of tenders by issuing amendment, in accordance with Clause 9, in which case all rights and obligations of the Employer and the Tenderers previously subject to the original deadline will then be subject to the new deadline. Any such new deadline as extended shall be issued in writing through Corrigendum and will be notified on the Karnataka Public Procurement Portal.

16.3 The Tenderers shall digitally sign their bids with their valid Digital Signature Certificate (DSC) as issued under the Information Technology Act, 2000 (Central Act 21 of 2000); and It shall be the responsibility of the tenderers to ensure that their tender is submitted in the Karnataka Public Procurement Portal within the last date and time specified for the receipt of the tenders.

17 Late Tenders

17.1 Any Tenderer trying to upload the tender after the deadline prescribed in Clause 16, will not be accepted on Karnataka Public Procurement Portal.

18 Modifications and Withdrawl of Tenders

18.1 Tenderers may modify contents of First or Second Electronic document separately for eachElectronic document or withdraw their tender on Karnataka Public Procurement Portal before the deadline prescribed in Clause 16.

18.2 Each Tenderer's modification for First Electronic document by clicking on delete button of any or all uploaded scanned document and upload the modified scanned document on the respective places, and modify the Second Electronic document by editing on the column of unit price entered and delete the unit prices entered and re-enter the modified unit rate of any or all the items of work, in accordance with Clause 14 & 15 or withdraw their Tenders by clicking on delete button of the bid.

18.3 No Tender may be modified or withdrawn after the deadline for submission of tenders.

18.4 Withdrawal or modification of a Tender between the deadline for submission of Tenders and the expiration of the original period of Tender validity specified in Clause 12.1 above or as extended pursuant to Clause 12.2 may result in the forfeiture of the earnest money deposit pursuant to Clause 13.

18.5 Tenderers may only offer discounts to, or otherwise modify the prices of their Tenders by submitting Tender modifications in accordance with this clause, or included in the original Tender submission.

E Tender Opening and Evaluation

19 Opening of First Electronic Document of all Tenders and evaluation to determine qualified Tenderers

19.1 The Employer or representative will open the tender of First Electronic Document of the Tenders received in Karnataka Public Procurement Portal at Office of the Executive Engineer, Infrastructure Division, Bangalore Development Authority, T.Chowdaiah road, Kumara Park West, Bengaluru-560 020, at designated date and time, without requiring the presence of Tenderer or in the presence of the Tenderers or their authorized representatives who choose to attend. In the event of the designated date of First Electronic Document of the Tenders opening being declared a holiday for the Employer, the First Electronic Document of the Tenders will be opened at the designated time and location on the next working day.
The Tenderers or their authorized representatives who are present shall sign a register evidencing their attendance.

19.2 Deleted.

19.3 List of submitted tenders termed as Received and list of incomplete tenders termed as Draft and all tender payments successfully received shall be displayed. The tenders which have been submitted in Karnataka Public Procurement Portal and whose tender payments were successfully received shall be opened. The Tenderers' names, the presence of requisite earnest money deposit has been made and other documents required have been produced may be indicated, but this shall be merely an examination of the documents and not an evaluation, and such other details as the Employer may consider appropriate will be announced by the Employer at the opening.

19.4 The Employer shall prepare minutes of the First Electronic Document Tender opening, including the information disclosed to those present in accordance with Sub-Clause 19.3.

19.5 Deleted.

19.6 The Employer will evaluate and determine whether each tender (a) meets the eligibility criteria defined in ITT Clause 2; (b) is accompanied by the required earnest money deposit as per stipulations in ITT Clause 13 and (c) meets the minimum qualification criteria stipulated in ITT Clause 3. The Employer will draw out a list of qualified Tenderers.

20 Opening of Second Electronic Document of qualified Tenderers and evaluation

20.1 The Employer will inform all the Qualified Tenderers the time, date and venue fixed for the opening of the Second Electronic Document containing the priced Tenders. The Employer will open the Second Electronic Document of Qualified Tenderers at the appointed time and date, without requiring the presence of Qualified Tenderer or in the presence of the Qualified Tenderers or their authorised representatives who choose to attend. In the event of the specified date of Second Electronic Document opening being declared a holiday for the Employer, the Second Electronic Document will be opened at the appointed time and location on the next working day.

20.2 Deleted.

20.3 The Tenderers' names, the Tender prices, the total amount of each Tender, any discounts and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening. No Tender shall be rejected at Tender opening.

20.4 The Employer shall prepare minutes of the Second Electronic Document Tender opening, including the information disclosed to those present in accordance with Sub-Clause 20.3.

21 Process to be confidential

21.1 Information relating to the examination, clarification, evaluation, and comparison of Tenders and recommendations for the award of a contract shall not be disclosed to Tenderers or any other persons not officially concerned with such process until the award to the successful Tenderer has been announced. Any effort by a Tenderer to influence the Employer's processing of Tenders or award decisions may result in the rejection of his Tender.

22 Clarification of Tenders

22.1 To assist in the examination, evaluation, and comparison of Tenders, the Employer may, at his discretion, ask any Tenderer for clarification of his Tender, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price or substance of the Tender shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Tenders in accordance with Clause 24

22.2 Subject to sub-clause 22.1, no Tenderer shall contact the Employer on any matter relating to its Tender from the time of the Tender opening to the time the contract is awarded. If the Tenderer wishes to bring additional information to the notice of the Employer, it should do so in writing.

22.3 Any effort by the Tenderer to influence the Employer in the Employer's Tender evaluation, Tender comparison or contract award decisions may result in the rejection of the Tenderers' Tender.

23 Examination of Tenders and determination of responsiveness

23.1 Prior to the detailed evaluation of Tenders, the Employer will determine whether each Tender is substantially responsive to the requirements of the Tender documents.

23.2 A substantially responsive Tender is one which conforms to all the terms, conditions, and specifications of the Tender documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the Tender documents, the Employer's rights or the Tenderer's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Tenderers presenting substantially responsive Tenders.

23.3 If a Tender is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

24 Correction of errors

24.1 Tenders determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows :

(a) where there is a discrepancy between the rates in figures and words, the lower of the two will govern; and

(b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.

24.2 The amount stated in the Tender will be adjusted by the Employer in accordance with the above procedure in vogue for the correction of errors and, with the concurrence of the Tenderer, shall be considered as binding upon the Tenderer. If the Tenderer does not accept the corrected amount the Tender will be rejected, and the earnest money deposit may be forfeited in accordance with Sub-Clause 13.6 (b).

25 Evaluation and Comparison of Tenders

25.1 The Employer will evaluate and compare only the Tenders determined to be substantially responsive in accordance with Clause 23.

25.2 In evaluating the Tenders, the Employer will determine for each Tender the evaluated Tender Price by adjusting the Tender Price as follows :

(a) making any correction for errors pursuant to Clause 24; and
(b) making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Sub Clause 18.5.

25.3 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations, and alternative offers and other factors which are in excess of the requirements of the Tender documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Tender evaluation.

25.4 The estimated effect of the price adjustment conditions under Clause 40 of the Conditions of Contract, during the implementation of the Contract, will not be taken into account in tender Evaluation.

25.5 If the tender of the successful tenderer is seriously unbalanced in relation to the Employer's estimate of the cost of the work to be performed under the contract, the Employer may require the Tenderer to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the performance security set forth in Clause 29 be increased at the expense of the successful Tenderer to a level sufficient to protect the Employer against financial loss in the event of default of the successful under the contract.

F Award of Contract

26 Award criteria

26.1 Subject to Clause 27, the Employer will award the Contract to the Tenderer whose Tender has been determined to be substantially responsive to the Tender documents and who has offered the lowest evaluated Tender Price, provided that such Tenderer has been determined to be (a) eligible in accordance with the provisions of Clause 2, and (b) qualified in accordance with the provisions of Clause 3.

27 Employer's right to accept any Tender and to reject any or all Tenders

27.1 Notwithstanding Clause 26, the Employer reserves the right to accept or reject any Tender, and to cancel the Tender process and reject all Tenders, at any time prior to the award of Contract, without thereby incurring any liability to the affected Tenderer or Tenderers or any obligation to inform the affected Tenderer or Tenderers of the grounds for the Employer's action.

28 Notification of award and signing of Agreement

28.1 The Tenderer whose Tender has been accepted will be notified of the award by the Employer prior to expiration of the Tender validity period by cable, telex, e-mail or facsimile confirmed by registered letter. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion, and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

28.2 The notification of award will constitute the formation of the Contract, subject only to the furnishing of Security deposit in accordance with the provisions of Clause 29.

28.3 The Agreement will incorporate all agreements between the Employer and the successful Tenderer. It will be kept ready for signature of the successful Tenderer in the office of Employer within 30 days following the notification of award along with the Letter of Acceptance. Within 20 days of receipt, the successful Tenderer will sign the Agreement and deliver it to the Employer.

28.4 Upon the furnishing by the successful Tenderer of the Performance Security, the Employer will promptly notify the other Tenderers that their Tenders have been unsuccessful.

29 Security deposit

29.1 Within 20 days of receipt of the Letter of Acceptance, the successful Tenderer shall deliver to the Employer a Security deposit in any of the forms given below for an amount equivalent to 5%

of the Contract price plus additional security for unbalanced tenders in accordance with Clause 25.5 of ITT and Clause 44 of the Conditions of Contract :

- Cash; or
- Banker's cheque / Demand draft / Pay Order in favour of Executive Engineer, Infrastructure Division, Bangalore Development Authority, T.Chowdaiah road, Kumara Park West, Bengaluru-560 020,payable at Bangalore; or
- A bank guarantee in the form given in Section 10; or
- Specified Small Savings Instruments pledged to Executive Engineer, Infrastructure Division, Bangalore Development Authority, T.Chowdaiah road, Kumara Park West, Bengaluru-560 020.

29.2 If the security deposit is provided by the successful Tenderer in the form of a Bank Guarantee, it shall be issued either by a Nationalized / Scheduled bank.

29.3 The security deposit if furnished in cash or demand draft can, if requested, be converted to interest bearing securities at the cost of the contractor.

29.4 Failure of the successful Tenderer to comply with the requirements of Sub-Clause 29.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Earnest money deposit.

30 Advance Payment and Security

30.1 Deleted.

31 Corrupt or Fraudulent practices

31.1 The Bangalore Development Authority (BDA) requires that the Tenderers / Suppliers / Contractors, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, BDA :

(a) will reject a proposal for award if it determines that the Tenderer recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

(b) will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a BDA contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a BDA contract.

(c) Employer shall initiate action as per Rule 26A and 26C of Karnataka Transparency Public Procurements Rules, 2000 and as amended in respect of Debarment of Tenderers or Contractor.

31.2 Furthermore, Tenderers shall be aware of the provision stated in sub-clause 50.2 of the Conditions of Contract.

SECTION 3 :QUALIFICATION INFORMATION

The information to be filled in by the Tenderer hereunder will be used for purposes of computing Tender capacity as provided for in Clause 3 of the Instructions to Tenderers. This information will not be incorporated in the Contract.

1.1 Constitution or legal status of Tenderer : [Attach copy]

Place of Registration : [Attach copy]

Principal place of business : [Attach copy]

1.2 Total value of civil engineering constructionworks executed and payments received in the last five years(in Rs. Lakhs).

: 2019-2020 _____
: 2020-2021 _____
: 2021-2022 _____
: 2022-2023 _____
: 2023-2024 _____

Note :

In support of this, the tenderer shall uploadon Karnataka Public Procurement Portal, the scanned copy of Profit and Loss statement for the civil engineering construction works executed and payments received, Balance sheet and Audited report, certified by the Chartered Accountant, of the past five financial years. Tender documents uploaded without the requisite certificate in the formats issued by the Chartered Accountant, will be summarily rejected.

1.3 Work performed as Prime Contractor (in the same name) on works of similar nature over during the five years specified in 1.2 above :

Project Name	Name of Employer	Description of work	Contract Number	Value of contract Rs. Lakhs	Date of issue of work order	Specified period of comple-tion	Actual date of comple-tion	Remarks explaining reasons for delay in completion of work
1	2	3	4	5	6	7	8	9
1								
2								
3								
4								

Note :

In support of this, the tenderer shall upload on Karnataka Public Procurement Portal, the scanned copy of certificate duly certified by the employer or competent authority not below the rank of Executive Engineer or competent authority authorised by the employer for having satisfactorily completed the work with year wise breakup, for the amount of work, and items executed of the work. Tender documents uploaded without the requisite certificate in the formats issued by the competent authority, will be summarily rejected.

If Authority desires, physical verification will be carried out for previous work completed.

1.4 Quantities of work executed as prime contractor (in the same name) during the last five years specified in 1.2 above :

Year	Name of Work	Name of Employer	Quantity of work performed		Remarks (Indicate contract reference)
2019-2020					
2020-2021					
2021-2022					
2022-2023					
2023-2024					

Note :

In support of this, the tenderer shall upload on Karnataka Public Procurement Portal, the scanned copy of certificate duly certified by the employer or competent authority not below the rank of Executive Engineer or competent authority authorised by the employer for having satisfactorily completed the work and with year wise breakup for the quantities executed of the work. Tender documents uploaded without the requisite certificate in the formats issued by the competent authority, will be summarily rejected.

If Authority desires, physical verification will be carried out for previous works completed and the quantities executed.

1.5 Information on works for which Tenders have been submitted and works which are yet to be completed as on the date of this Tender :

(A) Existing commitments and on-going works :

Description of Work	Place and State	Contract No. & Date	Name and Address of Employer	Value of contract (Rs. Lakhs)	Stipulated period of completion	Value of works remaining to be completed (Rs. Lakhs)	Anticipated date of completion
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

(B) Works for which Tenders already submitted:

Description of Work	Place and State	Name and Address of Employer	Estimated value of works (Rs. Lakhs)	Stipulated period of completion	Date when decision is expected	Remarks if any
(1)	(2)	(3)	(4)	(5)	(6)	(7)

Note :

(A) The statements showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Employer in charge, not below the rank of an Executive Engineer or by the Chartered Accountant (CA) of the tenderer, supported with Work Order and latest audited RA bill of the respective works listed in the Statement. (GO No. FD 6 PCL 2006 Bangalore dated 21-03-2007).

(B) The statements showing the works for which Tenders already submitted, the tenderer shall upload the copy of acknowledgement received on submission of tenders as against the notification on Karnataka Public Procurement Portal along with the details sought as in the statement, as against each such submission.

Tender documents uploaded on Karnataka Public Procurement Portal, without the requisite certificate in the formats issued by the competent authority, and necessary document for the submitted tenders and the details sought as against each such submission of tenders as in (A) and (B) above, will be summarily rejected.

The tenderer should provide an Affidavit swearing to the effect that the stated works are the only works and it is true to the best of his / her / their knowledge.

1.6 Deleted.

1.7 Reports on the financial standing of the tenderer, such as profit and loss statements and auditor's reports for the last five years;

1.8 Qualification and experience of the key technical and management personnel in permanent employment with the tenderer and those that are proposed to be deployed on this contract, if awarded.

1.9 Name, address, and telephone, telex, and fax numbers of the Tenderers' bankers who may provide references if contacted by the Employer.

1.10 Evidence of access to financial resources to meet the qualification requirement specified in ITT Clause3.3 (b) : Cash in hand, Letter of Credit etc. List them below and attach certificate from the Banker in the suggested format as under :

BANKER'S CERTIFICATE

This is to certify that M/s._____is a reputed company with a good financial standing. If the contract for this work, namely_____(*name of the work*) is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. _____to meet the working capital requirements for executing the above contract.

Name of the Bank, Senior Bank Manger
Address: _____

Note :

Tender documents uploaded without the requisite certificate in the formats as above issued by the competent authority, will be summarily rejected.

1.11 Deleted.

1.12 Information on litigations in which the Tenderer is involved :

Other Party (ies)	Employer	Details of disputes	Amount involved	Remarks showing present status

Note :

Tenderer shall upload documents in this regard with all sufficient information on litigation in which tenderer is involved as against such works. Tender documents uploaded without the requisite information in the formats or necessary document as required issued by the competent authority, will be summarily rejected.

1.13 The proposed methodology and program of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones.

SECTION 4: FORMS OF TENDER, LETTER OF ACEPTANCE, NOTICE TO PROCEED WITH THE WORK AND AGREEMENT FORM

Form of Tender

Description of the Works : Restoration and Rejuvenation to Bengaluru Hasi Karaga Temple, Kalyani And Construction of Conventions Center Beside Kanteerava Stadium

Tender

To

Executive Engineer
Infrastructure Division
Bangalore Development Authority
T.Chowdaiah Road, Kumara Park West
Bangalore-560 020.

GENTLEMEN,

We offer to execute the Works described above in accordance with the Conditions of Contract accompanying this Tender for the Contract Price of amount as submitted in the Second electronic document (Financial Bid).

This Tender and your written acceptance of it shall constitute a binding contract between us. We understand that you are not bound to accept the lowest or any Tender you receive.

The advance payment required is Rs._____.

We undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely “Prevention of Corruption Act 1988”.

We hereby confirm that this Tender complies with the Tender validity and Earnest money deposit required by the Tender documents.

We attach herewith our current income-tax clearance certificate.

Yours faithfully,

Authorised signature :

Name & Title of Signatory : _____

Name of Tenderer : _____
Address : _____
_____

Letter of Acceptance
(letterhead paper of the Employer)

_____[date]

To:_____[name and address of the Contractor]

Dear Sirs,

This is to notify you that your Tender dated_____for execution of the [name of the contract and identification number, as given in the Instructions to Tenderers] for the Contract Price of Rupees _____(_____) [amount in words and figures], as corrected and modified in accordance with the Instructions to Tenderers is hereby accepted by our Agency.

You are hereby requested to furnish Security deposit plus additional security for unbalanced tenders in terms of Clause 25.5 of ITT, in the form detailed in Clause 29.1 of ITT for an amount of Rs. _____ within 20 days of the receipt of this letter of acceptance valid up to 30 days from the date of expiry of Defects Liability Period i.e. up to_____and sign the contract, failing which action as stated in Para 29.4 of ITT will be taken.

Yours faithfully,

Authorised signature
Name and Title of Signatory
Name of Agency

Issue of Notice to proceed with the work
(letterhead paper of the Employer)

_____[date]

To:

_____(name and address of the Contractor)

Dear Sirs,

Pursuant to your furnishing the requisite security deposit as stipulated in ITT Clause 29.1 and signing of the contract agreement for the construction of_____a Tender Price of Rs._____, you are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully,

(Signature, name and title of signatory authorized to sign on behalf of Employer)

Agreement Form

Agreement

This agreement, made the _____ day of _____ 20__, between _____ [name and address of Employer] (hereinafter called "the Employer") of the one part and_____[name and address of contractor] (hereinafter called "the Contractor") of the other part.

Whereas the Employer is desirous that the Contractor execute _____ [name and identification number of Contract] (hereinafter called "the Works") and the Employer has accepted the Tender by the Contractor for the execution and completion of such Works and the remedying of any defects therein at a contract price of Rupees._____.

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.
2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all aspects with the provisions of the Contract.
3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying the defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.
4. The following documents shall be deemed to form and be read and construed as part of this Agreement,viz:
   - i) Letter of Acceptance;
   - ii) Notice to proceed with the works;
   - iii) Contractor's Tender;
   - iv) Contract Data;
   - v) Conditions of contract (including Special Conditions of Contract);
   - vi) Specifications;
   - vii) Drawings;
   - viii) Bill of Quantities; and
   - ix) Any other document listed in the Contract Data as forming part of the contract.

In witness whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

The Common Seal of _____
was hereunto affixed in the presence of:
Signed, Sealed and Delivered by the said _____

in the presence of:
Binding Signature of Employer _____
Binding Signature of Contractor _____

SECTION 5 - CONDITIONS OF CONTRACT

Table of Contents

A General

1 Definitions
2 Interpretation
3 Law governing contract
4 Employers decision
5 Delegation
6 Communications
7 Subcontracting
8 Other Contractors
9 Personnel
10 Employer's and Contractor's risks
11 Employer's risks
12 Contractor's risks
13 Insurance
14 Site Investigation Report
15 Query about Contract Data
16 Contractor to construct the Works
17 The Works to be completed by Intended Completion Date
18 Approvals by the Employer
19 Safety
20 Discoveries
21 Possession of the Site
22 Access to the Site
23 Instructions
24 Procedure for resolution of disputes

B Time Control

25 Program
26 Extension of the Intended Completion Date
27 Delays ordered by the Employer
28 Management meetings

C Quality Control

29 Identifying defects
30 Tests
31 Correction of defects
32 Uncorrected defects

D Cost Control

33 Bill of Quantities (BOQ)
34 Variations
35 Payment for Variations
36 Submission of bills for payment
37 Payments
38 Compensation events
39 Tax
40 Price Adjustment
41 Liquidated damages
42 Advance Payments
43 Securities
44 Cost of repairs

E Finishing of Contract

45 Completion
46 Taking Over
47 Final account
48 As built drawings and / or Operating and Maintenance Manuals
49 Termination
50 Payment upon termision
51 Property
52 Release from performance

F Special Conditions of Contract

CONDITIONS OF CONTRACT

A General

1 Definitions

1.1 Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meanings. Bold letters are used to identify defined terms.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Tender.

Compensation events are those defined in Clause 38 hereunder.

The **Completion Date** is the date of completion of the Works as certified by the Employer in accordance with Sub Clause 46.1.

The **Contract** is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.2 below.

The **Contract Data** defines the documents and other information which comprise the Contract.

The **Contractor** is a person or corporate body whose Tender to carry out the Works has been accepted by the Employer.

The **Contractor's Tender** is the completed Tender document submitted by the Contractor to the Employer.

The **Contract price** is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days; **months** are calendar months.

A **Defect** is any part of the Works not completed in accordance with the Contract.

The **Defects liability period** is the period named in the Contract Data and calculated from the Completion Date.

The **Employer** is the party who will employ the Contractor to carry out the Works.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

The **Initial Contract price** is the Contract Price listed in the Employer's Letter of Acceptance.

The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Employer by issuing an extension of time.

Materials are all supplies, including consumables, used by the contractor for incorporation in the Works.

Plant is any integral part of the Works which is to have a mechanical, electrical, electronic or chemical or biological function.

The **Site** is the area defined as such in the Contract Data.

Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Employer.

The **Start Date** is given in the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Dates.

A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract which includes work on the Site.

A **Variation** is an instruction given by the Employer which varies the Works.

The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the Contract Data.

2 Interpretation

2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their

normal meaning under the language of the Contract unless specifically defined. The Employer will provide instructions clarifying queries about the Conditions of Contract.

2.2 The documents forming the Contract shall be interpreted in the following order of priority :

(1) Agreement
(2) Letter of Acceptance, notice to proceed with the works
(3) Contractor's Tender
(4) Contract Data
(5) Conditions of Contract
(6) Specifications
(7) Drawings
(8) Bill of quantities and
(9) any other document listed in the Contract Data as forming part of the Contract.

3 Law governing contract

3.1 The law governing the Contract is the Laws of India supplanted by the Karnataka Local Acts.

4 Employer's decisions

4.1 Except where otherwise specifically stated, the Employer will decide contractual matters between the Employer and the Contractor.

5 Delegation

5.1 The Employer may delegate any of his duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

6 Communications

6.1 Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act).

7 Subcontracting

Deleted.

8 Other Contractors

8.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer.

9 Personnel

9.1 The Contractor shall employ the technical personnel (of number and qualifications) as may be stipulated by BDA from time to time during the execution of the work. The technical staff so employed shall be available at site as may be stipulated by the Employer.

9.2 If the Employer asks the Contractor to remove a person who is a member of the Contractor's staff or his work force stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

10 Employer's and Contractor's risks

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

11 Employer's risks

11.1 The Employer is responsible for the excepted risks which are :
- (a) rebellion, riot commotion or disorder unless solely restricted to employees of the Contractor or his Sub-Contractors arising from the conduct of the Works; or
- (b) a cause due solely to the design of the Works, other than the Contractor's design; or
- (c) any operation of the forces of nature (in so far as it occurs on the Site) which an experienced contractor :
  - (i) could not have reasonably foreseen; or
  - (ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures;
    - (A) prevent loss or damage to physical property from occurring by taking appropriate measures or
    - (B) insure against such loss or damage

12 Contractor's risks

12.1 All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

13 Insurance

13.1 The Contractor shall prior to commencing the works, effect and thereafter maintain insurances , in the joint names of the Employer and the Contractor, (cover from the first working day after the Start Date to the end of Defects Liability Period), in the amounts stated in the Contract Data :
- (a) for loss of or damage to the Works, Plants and Materials and the Contractor's equipment;
- (b) for liability of both Parties for loss, damage, death and injury to third parties or their property arising out of the Contractor's performance of the Contract including the Contractor's liability for damage to the Employer's property other than the Works and
- (c) for liability of both Parties and of any Employer's representative for death and injury to the Contractor's personnel except to the extent that liability arises from the negligence of the Employer, any Employer's representative or their Employees.

13.2 Policies and certificates for insurance shall be delivered by the Contractor to the Employer for his approval before the Start Date. All such insurance shall provide for compensation to be payable to rectify the loss or damage incurred. All payments received from insurers relating to loss or damage shall be held jointly by the Parties and used for the repair of the loss or damage or as compensation for loss or damage that is not to be repaired.

13.3 If the Contractor fails to effect or keep in force any of the insurances referred to in the previous sub-clauses or fails to provide satisfactory evidence, policies or receipts, the Employer may without prejudice to any other right or remedy, effect insurance for the cover relevant to such default and pay the premiums due and recover the same as a deduction from any other monies due to the Contractor. If no payments is due, the payment of the premiums shall be a debt due.

13.4 Alterations to the terms of an insurance shall not be made without the approval of the Employer.

13.5 Both Parties shall comply with any conditions of the insurance policies.

14 Site Investigation Reports

14.1 The Contractor, in preparing the tender, shall rely on any site investigation reports referred to in the Contract data, supplemented by any information available to the Tenderer.

15 Queries about the Contract Data

15.1 The Employer will clarify queries on the Contract Data.

16 Contractor to construct the Works

16.1 The Contractor shall construct the Works in accordance with the Specification and Drawings.

17 The Works to be completed by the Intended Completion Date

17.1 The Intended Completion Date for the whole of the Works is at the time of preparation of the tender document give the period required for completion of whole work and the milestones. When the Agreement is drawn after award of contract the dates can be put with the following milestones

Milestones:

	Physical works to be completed	Period from the date of issue of Notice to proceed with the work
Milestone 1 i.e., Structure work of building and clock tower		05 Months
Milestone 2 i.e., Finishing work of Building and clock tower OAT		03 Months
Milestone 3 i.e., Park and Gardening and finishing of clock tower		03 Months

18 Approval by the Employer

18.1 The Contractor shall submit Specification and drawings showing the proposed Temporary Works to the Employer, who is to approve them if they comply with the Specifications and Drawings.

18.2 The Contractor shall be responsible for the design of Temporary Works.

18.3 The Employer's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

18.4 The Contractor shall obtain approval of third parties to the design of third parties to the design of the temporary Works where required.

18.5 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Employer before their use.

19 Safety

19.1 The Contractor shall be responsible for the safety of all activities on the Site.

20 Discoveries

20.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The Contractor is to notify the Employer of such discoveries and carry out the Employer's instructions for dealing with them.

21 Possession of the Site

21.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the Contract Data the Employer is deemed to have delayed the start of the relevant activities and this will be Compensation Event.

22 Access to the Site

22.1 The Contractor shall allow the Employer and any person authorized by the Employer access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured / fabricated / assembled for the works.

23 Instructions

23.1 The Contractor shall carry out all instructions of the Employer which comply with the applicable laws where the Site is located.

24 Procedure for resolution of Disputes

24.1 If the Contractor is not satisfied with the decision taken by the Employer, the dispute shall be referred to Commissioner BDA within 30 days of the notification of the Employer's decision.

24.2 If neither party refers the dispute to Commissioner BDA within the above 30 days, the Employer's decision will be final and binding.

24.3 The Commissioner BDA shall conduct in accordance with the resolution procedure stated in the Special Conditions of Contract.

B Time Control

25 Program

25.1 Within the time stated in the Contract Data the Contractor shall submit to the Employer for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works.

25.2 The Employer's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Employer again at any time. A revised Program is to show the effect of Variations and Compensation Events.

26 Extension of the Intended Completion Date

26.1 The Employer shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date.

26.2 The Employer shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Employer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information.

27 Delays ordered by the Employer

27.1 The Employer may instruct the Contractor to delay the start or progress of any activity within the Works.

28 Management meetings

28.1 The Employer may require the Contractor to attend a management meeting. The business of a management meeting shall be to review the progress achieved and the plans for remaining work.

28.2 The responsibility of the parties for actions to be taken is to be decided by the Employer either at the management meeting or after the management meeting and stated in writing to be distributed to all who attended the meeting.

C Quality Control

29 Identifying defects

29.1 The Employer shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Employer may instruct the Contractor to search for a Defect and to uncover and test any work that the Employer considers may have a Defect.

30 Tests

30.1 If the Employer instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect the test shall be a Compensation Event.

31 Correction of defects

31.1 The Employer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

31.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Employer's notice.

32 Uncorrected defects

32.1 If the Contractor has not corrected a Defect within the time specified in the Employer's notice, the Employer will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

D Cost Control

33 Bill of Quantities (BOQ)

33.1 The BOQ shall contain items for the construction, installation, testing, and commissioning work to be done by the Contractor.

33.2 The BOQ is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the BOQ for each item.

34 Variations

34.1 The Employer shall have power to order the Contractor to do any or all of the following as considered necessary or advisable during the progress of the work by him :

(a) Increase or decrease of any item of work included in the Bill of Quantities (BOQ);
(b) Omit any item of work;
(c) Change the character or quality or kind of any item of work;
(d) Change the levels, lines, positions and dimensions of any part of the work;
(e) Execute additional items of work of any kind necessary for the completion of the works; and
(f) Change in any specified sequence, methods or timing of construction of any part of the work.

34.2 The Contractor shall be bound to carry out the work in accordance with any instructions in this connection, which may be given to him in writing by the Employer and such alteration shall not vitiate or invalidate the contract.

34.3 Variations shall not be made by the Contractor without an order in writing by the Employer, provided that no order in writing shall be required for increase or decrease in the quantity of an item appearing in the BOQ so long as the work executed conforms to the approved drawings.

34.4 The Contractor shall promptly request in writing to the Employer to confirm verbal orders and the officer issuing oral instructions shall confirm it in writing within 30 days, failing which the work shall be carried out as though there is no variation. In case variation is approved it shall be accompanied by BOQ, failing which the contractor shall be responsible for deviation if any.

35 Payments for Variations

35.1 Payment for increase in the quantities of an item in the BOQ up to 25% of that provided in the Bill of Quantities shall be made at the rates quoted by the Contractor.

35.2 For quantities in excess of 125% of the tendered quantity of an item as given in the BOQ, the Contractor shall be paid at the rate entered in or derived from in the Schedule of Rates (applicable for the area of the work and current at the time of award of contract) plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates prevalent at the time of award of contract.

35.3 If there is no rate for the additional, substituted or altered item of the work in the BOQ, efforts would be made to derive the rates from those given in the BOQ or the Schedule of Rates (applicable for the area of the work and current at the time of award of contract) and if found feasible the payment would be made at the derived rate for the item plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates prevalent at the time of award of contract.

35.4 If the rates for additional, substituted or altered item of work cannot be determined either as at 35.1 or 35.2 or 35.3 above, the Contractor shall be requested to submit his quotation for the items supported by analysis of the rate or rates claimed, within 7 days.

35.5 If the Contractor's quotation is determined unreasonable, the Employer may order the Variation and make a change to the Contract Price which shall be based on Employer's own forecast of the effects of the Variation on the Contractor's costs.

35.6 If the Employer decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

35.7 Under no circumstances the Contractor shall suspend the work on the plea of non-settlement of rates for items falling under this Clause.

36 Submission for bills for Payment

36.1 The Contractor shall submit to the Employer monthly bills of the value of the work completed less the cumulative amount paid previously.

36.2 The Employer shall check the Contractor's bill and determine the value of the work executed which shall comprise of (i) value of the quantities of the items in the BOQ completed and (ii) valuation of Variations and Compensation Events.

36.3 The Employer may exclude any item paid in a previous bill or reduce the proportion of any item previously paid in the light of later information.

37 Payments

37.1 Payments shall be adjusted for deductions for advance payment, other than recoveries in terms of the contract and taxes, at source, as applicable under the law. The Employer shall pay the Contractor within 60 days of submission of bill. The contractor shall be liable to pay liquidated damages for shortfall of progress.

For progress beyond the agreed programme payment is subject to availability of the grants.

37.2 Items of the Works for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

38 Compensation events

38.1 The following are Compensation events unless they are caused by the Contractor :

(a) The Employer does not give access to a part of the Site by the Site Possession Date stated in the Contract Data;
(b) The Employer orders a delay or does not issue drawings, specifications or instructions required for execution of works on time;
(c) The Employer instructs the Contractor to uncover or to carry out additional tests upon work which is then found to have no Defects;
(d) The Employer gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons;
(e) The effect on the Contractor of any of the Employer's Risks;
(f) The Employer unreasonably delays issuing a Certificate of Completion;
(g) Other Compensation Events listed in the Contract Data or mentioned in the Contract.

38.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date is extended. The Employer shall decide whether and by how much theContract Price shall be increased and whether and by how much the Intended Completion Dateshall be extended.

38.3 As soon as information demonstrating the effect of each Compensation event upon the Contractor's forecast cost has been provided by the Contractor, it is to be assessed by the Employer and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Employer shall adjust the Contract Price based on Employer's own forecast. The Employer will assume that the Contractor will react competently and promptly to the event.

38.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor not having given early warning or not having cooperated with the Employer.

39 Tax

39.1 The rates quoted by the Contractor shall be deemed to be inclusive of the sales and other taxes that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law.

39.2 Royalty charges will be recovered as per the latest Government orders as per applicable law and amendments.

40 Price Adjustment

Deleted

41 Liquidated damages

41.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract Data for each day that the Completion Date is later than the Intended Completion Date (for the whole of the works or the milestone as stated in the Contract Data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor's liabilities.

41.2 The liquidated damages for the whole of the works are 0.1% per day for the balance work.

	Liquidated Damages per Day
Milestone 1	1000/- per Day
Milestone 2	1500/- per Day
Milestone 3	2000/- per Day

41.3 The maximum amount of liquidated damages for the whole of the works is ten percent of final contract price.

41.4 If the Intended Completion Date is extended after liquidated damages have been paid, the Employer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment of bill.

42 Advance Payments

Deleted

43 Securities

43.1 The Security deposit (including additional security for unbalanced tenders) shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and type of instrument acceptable to the Employer. The Security deposit shall be valid until a date 30 days from the date of expiry of Defects Liability Period and the additional security for unbalanced tenders shall be valid until a date 30 days from the date of issue of the certificate of completion.

44 Cost of Repairs

44.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E Finishing the Contract

45 Completion

45.1 The Contractor shall request the Employer to issue a Certificate of Completion of the Works and the Employer will do so upon deciding that the Work is completed.

46 Taking over

46.1 The Employer shall take over the Site and the Works within seven days of issuing a certificate of Completion.

47 Final account

47.1 The Contractor shall supply to the Employer a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Employer shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 90 days of receiving the Contractor's account if it is correct and complete. If it is not, the Employer shall issue within 90 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Employer shall decide on the amount payable to the Contractor and make payment within 60 days of receiving the Contractor's revised account.

48 As built drawings and / or Operating and Maintenance Manuals

48.1 If "as built" Drawings and / or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract Data.

48.2 If the Contractor does not supply the Drawings by the dates stated in the Contract Data, or they do not receive the Employer's approval, the Employer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

49 Termination

49.1 The Employer may terminate the Contract if the other party causes a fundamental breach of the Contract.

49.2 Fundamental breaches of Contract include, but shall not be limited to the following :

(a) the Contractor stops work for 45 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Employer;

(b) Deleted;

(c) The Contractor becomes bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) Deleted;

(e) the Employer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Employer;

(f) the Contractor does not maintain a security which is required;

(g) the Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and

(h) if the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in the executing the Contract.
For the purpose of this paragraph : "corrupt practice" means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution. "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detrimentof the Employer, and includes collusive practice among the Tenderers either prior to or after tender submission, designed to establish tender prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition."

49.3 When either party to the Contract gives notice of a breach of contract to the Employer for a

cause other than those listed under Sub Clause 49.2 above, the Employer shall decide whether the breach is fundamental or not.

49.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

49.5 If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

50 Payment upon Termination

50.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Employer shall prepare bill for the value of the work done less advance payments received up to the date of the bill, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor the difference shall be a debt payable to the Employer.

50.2 If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Employer shall prepare bill for the value of the work done, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the contract, and less taxes due to be deducted at source as per applicable law and make payment accordingly.

51 Property

51.1 All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor’s default.

52 Release from performance

52.1 If the Contract is frustrated by any event entirely outside the control of either the Employer or the Contractor the Employer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made.

F Special Conditions of Contract

1 Labour

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

The Contractor shall, if required by the Employer, deliver to the Employer a return in detail, in such form and at such intervals as the Employer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Employer may require.

The Contractor has to strictly adhere to the Labour Regulation Act and The Building and other construction workers (Regulation of Employment and Conditions of Service) Act 1996.

2 Compliance with labour regulations

During continuance of the contract, the Contractor and his sub contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications / bye laws / Acts / Rules / regulations including amendments, if any, on the part of the Contractor, Employer shall have the right to deduct any money due to the Contractor including his amount of security deposit. The Employer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

3 Protection of Environment

The contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation. During continuance of the contract, the contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

4 Arbitration (Clause 24)

Deleted.

5 Death of a Contractor

In the case of the death of a Contractor after executing the agreement/commencement of the work, his legal heir, if an eligible registered contractor and willing, can execute and complete the work at the accepted tender rates irrespective of the cost of the work.

6. Special Instructions to tenderers

a) As per the circular no:CWS/REP/CIR/CR01/13-14 dated:30-07-2013 issued by the Chief Executive Officer and Labour Commissioner, Government of Karnataka, the agency should deploy only registered labours.
b) The Contractor shall renew the Labour enrollment from time to time and inform the officer designated accordingly. In the event of the Contractor not securing the renewal of the Labour enrollment within 15 days from the date of issue of work order or in the effect of the contractor not renewing the enrollment, it shall be open to the Bangalore Development Authority to terminate this agreement forthwith, without being required to give any advance notice of such termination.
c) The successful bidder should ensure deploying adequate no. of manpower at all the time without causing any hindrance to any of the services. In case of absence of particular person, same shall be replaced immediately.

d) The contractor shall be solely responsible for the safety of their staff and the General Public on the site and shall observe all the precautionary and safety measures throughout the Maintenance of Building.
e) All the cleaning material including access ladder, vacuum cleaner, Tools, plants, materials required for carrying out the operations shall be arranged by the contractor. He shall also arrange to supply at his own cost soaps, phenyl, disinfectants, cleaning agents, chemicals, room fresheners etc., for use during the cleaning operations.
f) The Contractor shall ensure suitable supervision and deploy labour in discharging of specified activities. The personnel so deployed shall be under the direct control and supervision of the Contractor. Bangalore Development Authority shall have nothing to do with the employees of the contractor.
g) The contractor shall carry out the cleaning and other connected operations indicated by the Bangalore Development Authority from time to time by issuing appropriate cleaning materials of approved quality and make.
h) During the house keeping operations, the Contractor shall carry out the works in harmony with the officials of the Bangalore Development Authority in the best overall interest of the work.
i) The work shall be carried out with due diligence. In the event of any dispute arising, the decision of the officer designated shall be final, binding and conclusive.
j) The Contractor shall not engage any person who is below 18 years and above 45 years of age.
k) The personnel deployed by the Contractor shall maintain a high standard of discipline.
l) The contractor shall be responsible for assigning duties to personnel deployed, payment of wages, ESI, Provident Fund, Bonus, Group Link, Insurance Scheme etc., as per relevant law of the land and other compensation payable under the workmen's compensation Act or any other benefits to the staff employed by the Contractor. The Bangalore Development Authority shall not be responsible for non payment of any of the amounts to the staff of the contractor on account of statutory acts applicable, In the event of failure to comply with these provision, the same shall be recovered from the bills due to the contractor. The contractor shall disburse the wages to its personnel deployed in the presence of the officer designated by the Bangalore Development Authority.
m) The officer in charge reserves the right to order for repeating the housekeeping operations, if in his opinion the cleaning operation is not in accordance with the requirements and as per instructions issued from time to time.
n) The Contractor shall make his own arrangements for the storage of all materials, tools, plants at a specified place earmarked for the purpose. The safety and security for the same will be arranged by him at his own cost. Bangalore Development Authority shall not be responsible for loss of materials and no claim whatsoever shall be entertained on this account.
o) The Bangalore Development Authority shall not be responsible for loss to the property or to personnel of the Contractor in the event of fire, catastrophe or civil commotion etc., if they so occur.
p) Electrical power / Water required for carrying out the housekeeping operations will be made available free of cost to the extent possible by the Bangalore Development Authority and Contractor shall exercise utmost care for judicious use of the same.
q) The Contractor under no circumstances whatsoever should not slowdown / stop the designated operations as mentioned in the conditions aforesaid.
r) If the services rendered by the Contractor are not up to the standard, the same will be brought to the notice of the Contractor with a view to provide him/her an a opportunity to improve the same in a stipulated period. If no improvement in the services rendered during the stipulated period is observed, a penalty equivalent up to 15% (Fifteen percent) of the value of the monthly payment will be levied on the Contractor and will be deducted from the monthly bill.
s) On completion of the House Keeping operation the Contractor will remove all tools, equipment, debris etc., from the office premises and leave the place in a neat and tidy manner as directed by the officer in charge.

7. Scope of Work :

THE SCOPE OF WORK COVERS UNDER QUOTED PRICE:

- The quoted price shall include all costs of Men, materials, consumables, equipments etc., required to carry out the services by the agency as detailed in the following scope of work. The details of manpower to be mobilized by the contractor at site including mobilization anddemobilization to carry out the following scope of works are provided in **Annexure – I.**

The work includes Construction of Building including Infrastructure viz, Sump Tank, , water supply & sanitary works, , Internal Electrification work, Compound wall, Entrance arch, Furnitures. Drawings enclosed with this tender document. Estimates, Design & Drawings are to be part and parcel of the tender document.

1.1 Work to be executed as conventional type.

a. Concrete for all Structures (Sub Structure or Super Structure) shall be minimum of M25 Grade and rebars / caging shall be minimum of grade Fe.550.

b. All water supply lines, sanitary and electrical installations shall be in accordance with the provisions in the latest version of the NBC.

c. Construction of the Buildings as per Approved Design and Drawings,

d. the plinth of the building shall be least average 60cm higher than the surrounding formation level and higher plinth height may be required if site warrants.

e. The Building units are to be provided with internal electricity, water supply and sanitary connections with all fixtures as per the approved drawings and as per IS Specification

The work comprises supply, laying, testing, commissioning etc.of water supply, plumbing, drainage & sanitation.

The work includes the following activities connected with the job :-

i. Supply and delivery of all required pipes and other materials

ii. Earthwork in excavation for trenches, pits/chambers/manholes etc

iii. Civil works connected with the laying/erection of pipe lines such as making holes in the wall etc. and repairing them after pipe erection, construction of pipe supports, valve chambers, manholes, bedding and covering of pipe laying wherever required.

iv. Laying and jointing of pipe lines as specified in this chapter.

v. Testing of pipe lines after laying as per standard tests specified in this chapter

vi. Back filling of trenches after successful and satisfactory testing.

vii. Back filling of trenches after successful

and satisfactory testing. viii.Commissioning

of entire network

ix. Safe custody of the pipes/materials/equipment/work and other obligation stated elsewhere in the specification.

Supplying and installation of Childrens Play Equipments, Pathway construction, planting, turfing Open Air Theatre, Seating arrangements, etc

Any other activities which are not mentioned above but essential and required.

SECTION 6 - CONTRACT DATA

Items marked "N/A" do not apply in this Contract.

The following documents are also part of the Contract:	**Clause Reference**
The Schedule of Operating and Maintenance Manuals	[48]
The Methodology and Program of Construction	[25]
Site Investigation Reports	[14]
The Schedule of Key and Critical Equipment to be deployed on the work as per agreed program of construction.	[25]
The Employer is : Commissioner Bangalore Development Authority	[1.1]
Address : Office of the Commissioner Bangalore Development Authority T.Chowdaiah Road, Kumara Park West Bengaluru-560 020. Name of Authorised representative : Executive Engineer, Assistant Executive Engineer, Assistant / Junior Engineer	
The name and identification number of the Contract is : Restoration and Rejuvenation to Bengaluru Hasi Karaga Temple, Kalyani And Construction of Conventions Center Beside Kanteerava Stadium Tender Reference No. : BDA/2024-25/BD/WORK_INDENT	[1.1]
The Works consist of Construction of Building, Parks and playground, etc and other allied works, etc., as per KSB, KSRB, MORTH and IS specification.	
The start date shall be the date of issue of notice to proceed with the work.	[1.1]
The Intended Completion Date for the whole of the Works is 12 months.	[17, 26]
The Site Possession Date is from the date of issue of notice to proceed with the work.	[21]
The Site is located at T.Chowdaiah Road, Kumara Park West, Bengaluru -560 020.	[1.1]
The Defects Liability Period is 360 Days from the date of completion.	[31]
Insurance requirements are as under:	[13]

	Type of Cover	**Minimum cover for Insurance**
(i)	Works and of Plant and materials	The sum stated in the Agreement plus 20%
(ii)	Loss or damage to equipment	Full replacement cost
(iii)	Loss or damage to property of Third Party	Full replacement cost
(iv)	Personal injury or death insurance (a) for Third Party	

(v)	(b) for Contractor's employees or labour	In accordance with the statutory requirements applicable to Karnataka	

Price Adjustment Formula; ***"N/A"*** [40]

The liquidated damages for the whole of the works are 0.1% of the contract price per day. [41]

The maximum amount of liquidated damages for the whole of the works is ten percent of final contract price. [41]

The amounts of the advance payment are : ***"N/A"***. [42]

The date by which "as-built" drawings (in scale 1 in 1000) in 2 sets are required is within 30 days of issue of certificate of completion of Whole or Section of the Work as the case may be [48]

The date by which Operating and Maintenance Manuals are required is within 30 days of issue of certificate of completion of Whole or Section of the Work as the case may be. ***"N/A"*** [48]

The amount to be withheld for failing to supply "as built"drawings or supply of Operation and Maintenance Manuals by the date required is Rs.1%**.** [48]

The following events shall also be fundamental breach of the contract : [49.2]

1. The contractor has contravened Clause 9 of CC.

The percentage to apply to the value of the work not completed representing the Employer's additional cost for completing the Works shall be 30 percent. [50.1]

SPECIFICATIONS FOR CIVIL WORKS

PART – I

MATERIALS

CONTENTS :

1.0 GENERAL

1.1 Scope

1.2 Standard

1.3 Approval and Test

1.4 Codes

1.5 Rejection of Materials

2.0 MATERIALS FOR CONCRETE

2.1 Aggregates

2.2 Coarse Aggregates

2.3 Fine Aggregates

2.4 Lime

2.5 Surkhi

2.6 Cement

2.7 Water

2.8 Admixtures for Concrete

2.9 Interval of Routine Test

3.0 STEEL

3.1 For Reinforcement

3.2 For Binding Works

3.3 For Light Structural Work and Insert

3.4 Foundation Bolts

3.5 Testing

3.6 Conduits

4.0 BRICK AND STONES

4.1 Bricks

4.2 Handling

4.3 Samples Inspection

4.4 Brick Bats

4.5 Solid Concrete Block

4.6 Stones (Granite, trap, sandstone and quartzite etc.,)

4.7 Cement, Lime and Water

4.8 Sand for Masonry Mortar

5.0 ***SAND FOR PLASTERING***

6.0 **MATERIALS FOR FLOORING & PAVING**

6.1 Cement & Binders

6.2 Aggregates

6.3 Pigments

6.4 Dividing Strips

6.5 Mosaic Tiles

6.6 Ceramic Tiles

6.7 Glazed Tiles

6.8 Cuddapah Slabs

6.9 Green Kota Stone

7.0 ***TIMBER***

7.1 General

7.2 Teak Wood/Sal/Beja Sal/Deodar/Kail and other varieties

7.3 Storage & Inspection

7.4 Moisture content

7.5 Allowance for Bulk Timber

7.6 Flush Door Shutters, Shelves

7.7 Plywood for general purpose

7.8 Veneered decorative plywood

7.9 Marine plywood

8.0 ***FITTINGS FOR DOORS, WINDOWS, ETC.,***

8.1 General

8.2 Hinges

8.3 Sliding Door Bolts

8.4 Tower bolts

8.5 Door bolts

8.6 Mortice Locks and Rebated mortice Locks

8.7 Floor Door Stopper

8.8 Hooks and eyes

8.9 Window peg stays

8.10 Quadrant stays

8.11 Fan light pivots

8.12 Fan light catch

8.13 Putty

9.0 METAL DOORS, WINDOWS, VENTILATORS

9.1 General

9.2 Steel doors, Windows, Ventilators

9.3 Aluminium Doors, Windows, Ventilators,

9.4 M.S. Bolts, etc.,

9.5 Hardware

9.6 Mastic

10.0 GLASS

10.1 General

10.2 Plain Transparent Glass

10.3 Ground or Frosted Glass

10.4 Thickness

10.5 Inspection

11.0 PAINT

11.1 General

11.2 Sampling & Testing

11.3 Storage

11.4 Paints for Priming

11.5 Paints for Finishing

11.6 White Wash

11.7 Cement Paint

11.8 Distemper

12.0 WATER PROOFING MATERIALS

12.1 Integral Cement water proofing compounds

12.2 Surface Application Materials,

12.3 Polymer based paints

13.0 LEAD

13.1 General

14.0 DRAINAGE AND SANITATION (INTERVAL)

14.1 General

14.2 P.V.C. Waste Pipe

14.3 Stoneware Pipes

14.4 Cast from Pipes and AC Pipes (Rain Water Pipes)

14.5 Sanitary appliances (I.W.C.)

14.6 Wash Hand Basin

14.7 Flat Back Lipped Urinal

14.8 Mirror Frames

14.9 Toilet Shelf

14.10 Towel Rail

14.11 Soap Container

14.12 CP Flush Vales for urinals

14.13 Gully Trap

14.14 C.I. Manhole Cover and Frame

15.0 WATER SUPPLY & PLUMBING (INTERNAL)

15.1 General

15.2 G. I. Pipes and Fittings,

15.3 Bib Tap and Stop cock

15.4 Valves

15.5 Shower Rose

15.6 Storage Tank

15.7 Misc., Items

16.0 EXTERNAL SEWAGE & DRAINAGE

16.1 C.I. Pipes

16.2 Washers

16.3 Gaskets

16.4 Caulking Lead

16.5 Salt Glazed stoneware Pipes

16.6 Steel Pipes

16.7 Galvanized Steel Barbed Wire for fencing

17.0 APPROVED BRAND AND/OR MANUFACTURE'S NAME FOR SOME OF THE IMPORTANT MATERIALS

18.0 MATERIALS NOT SPECIFIED

1. GENERAL

1.1 Scope

This part deals with the requirements of materials for use in construction work with regard to quality, testing, approval and storage, before they are used on work. This part is supplementary to Part -II: Workmanship and other requirements of the Technical Specifications for Civil Works.

1.2 Standard

A high standard of quality is required for all materials used in construction work. They shall be the best of the kind obtainable indigenously in each case and shall be procured from manufacturers of repute in order to ensure uniformity of quality and assurance of timely supply.

1.3 Approval and Tests

18.1.1 All materials to be used in construction shall be subject to approval of the Project Consultants. The contractor shall supply sufficiently in advance with samples of the materials including the supporting test results from the approved laboratory and other documentary evidence from the manufacturer wherever applicable and indicating the types of materials and their respective sources. The delivery of materials at site shall commence only after the approval of the quality, grading and sources of the materials by the Project Consultants

18.1.2 The quality of all materials once approved shall be maintained throughout the period of construction and periodical tests shall be carried out to ensure that it is maintained. Such routine tests shall be listed under the different materials and/or the Project. Consultants may order as from time to time.

18.1.3 Where a particular "Brand" or "Make" of material is specified in the Schedule of Items or Technical Specifications, such "Brand" or "Make" of material alone shall be used on the work. Should it become necessary for any reason (such as non-availability/ceased to be produced), to use any material other than the specified Brand" or "Make, the contractor shall submit sample of the same to the Project Consultants for together with test certificates and other documents necessary for examining and giving approval thereof.

1.4 Codes

1.4.1.1 The years of publication against various standards, referred in this specification, corresponding to the latest standards as on date of preparation of this specification. During use of this specification in future, the latest publication as on date shall be referred to. Where the BIS OR IRC does not yet publish standards, adoptable British Standards or other International Standards shall apply.

1.4.1.2 In case of any conflict in meaning between these specifications and those of BIS or IRC, or British/International Standard; the provisions of these specifications shall prevail.

1.5 Rejection of Materials

1.5.1.1 Any material brought to site which, in the opinion of the Project Consultants is damaged, contaminated, deteriorated or does not comply with the requirement of this specification shall be rejected.

1.5.1.2 If the routine tests or random site tests show that any of the materials, brought to site, do not comply in any way with the requirements of this specification or of I.S. codes as applicable, then that material shall be rejected.

1.5.1.3 The contractor at his owns cost shall remove from site any and all such rejected material within the time specified by the Project Consultants

2.0 MATERIALS FOR CONCRETE

2.1 *Aggregates*

2.1.1 Aggregates shall comply with the requirements of IS: 383 - 1970 "Coarse and Fine Aggregates for Concrete". They shall be hard, strong, dense, durable, clean and free from veins and adherent coating, vegetable matter and other deleterious substances; and shall be obtained from approved sources. Aggregates shall not contain ant harmful material such as fragments, seashells and organic impurities in such quantity as to affect the strength or durability of concrete. Aggregates, which are chemically reactive with alkalis of cement, shall not be used. Aggregates, which are not sufficiently clean, shall be washed in clean fresh water to the satisfaction of the Project Consultants.

2.1.2 ***Testing***

All aggregates shall be subject to inspection and testing. The Contractor shall submit samples for testing as may be required by the Project Consultants Sampling and Testing shall be carried out in accordance with IS: 2386 -1963 "Methods of Test for Aggregates for concrete"

2.1.3 ***Grading***

The Contractor shall ensure that the full range of aggregate used for making concrete is graded in such a way as to ensure a dense workable mix. The delivery of aggregates will commence only when the Project Consultants has approved the samples and the quality and grade shall be maintained consistent and equal to the approved sample. Before construction commences, the Contractor shall carry out a series of tests on the aggregates and on the concrete made there from to determine the most suitable grading of the available aggregates. Once the most suitable grading has been found, the grading shall be adopted for the construction of the works and periodic tests shall be carried out to ensure that it is maintained.

2.1.3.1 ***Size and grading of fine aggregates***

The grading shall conform to IS: 383 -1970 and shall be within the limits of grading Zone - III. The maximum size of particle shall be 4.75 mm and shall be graded down. Sand containing more than 10% of fine grains passing through 150-micron sieve or having the fine less modules less than 2 shall not be used for concrete work.

2.1.3.2 **Size and grading of coarse aggregates**

The nominal maximum size of the aggregates for each mark of concrete or for each type of work shall depend upon the description of the particular item in the Schedule of Items and/or according to relevant clauses of IS : 456 - 2000. The aggregates shall be well graded and the grading shall conform to relevant requirements of IS 383 -1970 depending upon the maximum nominal size as specified or as required

2.1.3.3 ***Fine aggregates for mortar and grout***

The grading of fine aggregate for mortar and grout shall be within the limits of grading zone III and IV as defined in IS: 383 -1970

2.1.4 ***Storage & stacking***

Care shall be taken in the storage to avoid intrusion of any foreign materials into the aggregates and where two types of aggregates are stored close to each other, they shall be separated by a wall or plate. In case of stockpiling, care shall be taken to avoid forming pyramids resulting in segregation of different sized materials. The height of the stacks shall be generally limited to 150 cm.

2.2 *Coarse Aggregates*

2.2.1 Types

The type of coarse aggregate viz., stone chips, gravel or broken brick shall be as described in the Schedule of Items. Unless otherwise specified in the Schedule of items, stone chips shall be used as coarse aggregate.

2.2.2 *Stone chips*

It shall be crushed or broken from hard stone obtained from approved quarries of igneous or metamorphic origin. The stone chips shall be hard, strong, dense, durable and angular in shape. It shall be free from soft, friable, thin, flat, elongated or laminated and flaky pieces and free from dirt, clay lumps, and other deleterious materials like coal, lignite's, soft fragments and other foreign materials, which may affect adversely the strength & durability of concrete The total amount of deleterious foreign materials shall not exceed 5% by weight according to relevant clause of IS: 383 -1970. If found necessary the stone chips shall be screened and washed before use.

2.2.3 *Broken bricks/Brick aggregates*

These shall be obtained by breaking well burnt or over burnt dense brickbats. They shall be homogeneous in texture, well graded in size, roughly cubical in shape, clean and free from dirt, clay, silt or any other deleterious matter. Before use, these shall be screened.

2.3 *Fine Aggregates*

2.3.1 Unless specified otherwise it shall either be Natural River sand or pit sand,

2.3.2 Sand shall be clean, sharp, strong, angular and composed of hard siliceous material. It shall not contain harmful organic impurities in such form or quantities as to affect adversely the strength and durability of concrete. Sand for reinforced concrete shall not contain any acidic or other impurities, which is likely to attack steel reinforcement. The percentage of all deleterious materials including silt. clay, etc., shall not exceed 5% by weight. If directed and shall be screened or washed before use to the satisfaction of Project Consultants.

2.3.3 *Crusher dust*

Crusher stone dust (that is retained on 300 micron sieve) may be used as replacement for certain quantum of sand aiming to improve the fineness modulus of fine aggregate. Suitable trial mixes shall arrive at the quantum of replacement for sand. The Project Consultants will decide the final usage of crusher dust depending on the circumstances.

2.4 *Lime*

Lime for mortars and concrete shall conform to IS-712-1984. The total of CaO and MgO content in quick lime shall not be less than 85% (MaO shall not exceed 5%). Quicklime, after slaking, shall leave a residue of not more than 55 by weight on on IS sieve 85.

2.5 *Surkhi*

Surkhi used in lime concrete for flooring, terracing etc., shall conform to IS 3182 _ 1986. Surkhi shall be made from well-burnt bricks or brickbats. Surkhi shall pass through 1.5. sieve 3.35 mm with at least 50% of it passing through 1.5. sieve 1.70 mm and be perfectly clean and free from foreign matter. Surkhi shall not be made from bricks, which have come in contact with any mortar.

2.6 *Cement*

Ordinary Portland cement/Portland cement complying with the requirements of IS: 269 -1989 and IS: 455 -1989 respectively shall be used for making plain and reinforced concrete, cement grout and mortar. Other types of cement may be used depending upon the requirements of certain jobs with the approval of the Project Consultants. These shall conform to the following standards :-

Portland Pozzolana Cement

Rapid Hardening Portland

Cement 43 Grade Ordinary

Portland Cement 53 Grade

Ordinary Portland Cement White

Portland cement

2.6.1 *Testing of samples*

The contractor shall supply a copy of the manufacturer's test certificate for each consignment of cement supplied by him and consignments shall be used on work in order of delivery. The contractor shall supply samples of cement to the Project Consultants as frequently as he may require for testing. The sampling of cement for testing shall be according to IS: 3535-1986. All tests be in accordance with the relevant clauses of IS 4031 (Part -1 to Part -15) 1988 to 1991 & IS: 4032-1985.

2.6.2 *Contractor's responsibility*

From the time a consignment of cement is delivered at site and tested and approved by the Project Consultants until such time as the cement is used on the works, the Contractor shall be responsible for keeping the same in sound and acceptable condition and at his expense and risk. Any cement, which deteriorates while in the Contractor's charge and is rejected as unsuitable by the Project Consultants, shall be removed from the site to outside the limits of works at the cost of Contractor within two days of ordering such removal by the Project Consultants.

2.6.3 *Stock of cement*

In order to ensure due progress, the Contractor shall at all times maintain on the site at least such stock of cement as the Project Consultants may from time to time consider necessary. No cement shall be used upon the woks until it has been accepted as satisfactory by the Project Consultants.

2.6.4 *Storage of cement*

The cement shall be stored in such a manner as to permit easy access for proper inspection and in a suitable weather-tight, well ventilated building to protect it from dampness caused by ingress of moisture from any source. Different types of cement shall be stored separately. Cement bags shall be stacked at least 15 to 20 cm clear of the floor leaving a space of 60 cm around the exterior walls. The cement shall not be stacked more than 10 bags high. Each consignment of cement shall be stacked separately to permit easy access for inspection.

2.7 *Water*

Water used for mixing concrete and mortar and for curing shall be clean and free from injurious amounts of oil, acid, alkali, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. The pH value of water shall generally be not less than '6'. Water has to meet the requirements mentioned in clause 5.4 of IS 456-2000 Water shall be obtained from and approved source.

Where, if it is obtained from a source other than a supply main, it shall be tested to establish its suitability. Water for construction purpose shall be stored in proper storage tanks to prevent any organic impurities getting mixed up with it.

2.8 *Admixture for Concrete*

2.8.1 **Approval**

Admixtures to concrete shall not be used without the written consent of the Project Consultants. When permitted, the Contractor shall furnish full details from the manufacturer and shall carry out such test as the Project Consultants may require before admixture is used in the work.

2.9 *Interval of Routine Test*

2.9.1 The routine tests of materials, delivered at site, shall be at the following intervals:

Aggregate- Fortnightly or for every 200 m^3 whichever is earlier and in respects generally as per IS: 2386 (Part 1 to 8) 1963.

Cement - Fortnightly or each consignment within 4 days of delivery and in other respects generally as per IS 4031-1988.

Water - Once in two months for source of supply and in other respects.

Generally as per IS 456-2000.

Reinforcement - For each consignment within 4 days of delivery in accordance with IS: 1786- 1985,IS: 1599-1985 and IS: 1608-1972.

3.0 STEEL

3.1 *For Reinforcement*

Reinforcing bars for concrete shall be round steel bars of the following types as may be shown on the drawing:-

(i) "High strength deformed steel bars / TMT conforming to BE: 1786-1985 for Concrete Reinforcement"

All reinforcement bars shall be of uniform cross sectional area and be free from loose mill scales. dust. loose rust, coats of paint. oil or other coatings which may destroy or reduce bond. Unit weight of reinforcement bars conforming to IS: 1786-1985 is given below.

Nominal Size (Dia) (mm)	*Mass Per Metre Run (Kg)*
6	0.222
8	0.395
10	0.617

12	0.888
16	1.580
20	2.470
25	3.850
28	4.830

3.2 *Binding Wire*

Binding wire for reinforcement shall be annealed steel wire 20 SWG conforming to BE: 2801978 "Specification for Mild Steel Wire".

Light structural work and inserts

Steel for light structural work and for preparation of inserts and embedment shall conform to BE: 2062- 1992 "Steel for General Structural Purposes- Specification":

3.3 *Foundation Bolts*

3.3.1 Bolts to be embedded din concrete shall unless otherwise detailed in drawings confirm to B.E. 5624-1970 “Specification for Foundation Bolts”. Materials for bolts, shall, unless otherwise mentioned in drawings or the Schedule of items, be corrosive resistant/coated steel confirming to IS : 2062-1992

3.3.2 Nuts and Locknuts shall confirm to BE : 1363 – (Part 1 to 3) – 1992 “Specification for Black Hexagon Bolts, Nuts and Locknuts (Diameter 6 – 39) mm and Black Hexagon Screws. “Specification for Hexagon Bolts and Nuts (M-42 to M-150) ”

3.3.3 Plain washers shall confirm to BE : 2016-1967 “Specifications for Plain Washers” and Spring Washers shall confirm to BE : 3063 – 1972 “Spring Washers for Bolts, Nuts and Screws “.

3.4 *Testing*

Test certificates from manufacturer shall be submitted for each consignment. Any additional test which the Project Consultants may require shall be done according to IS 1786 – 1985, 1566-1982, 280-1978, 2062-1992, 1161 – 1979, 2614 – 1969, 3063-1972, 1239 – (Part I and II) – 1990 and 1992 and 1367 -
1980

3.5 *Conduits :*

3.5.1 **Steel For Electrical Wiring :**

Rigid Steel conduits for electrical use shall conform to Be 9537 (Part – 2) – 1981 for rigid pipes and to BE 3480 – 1966 for flexible conduits. Fittings for conduits shall conform to BE 2667 – 1988.

All conduit pipes shall be finished with galvanized or stove-enameled surface. All accessories shall be threaded type and pipes shall be jointed by means of screwed couplers only. Bend in conduits shall be made to the dimension shown in drawing, but a minimum of 12 times the diameter. Where shown in drawing they shall be treated with anticorrosive, preservative as specified.

3.5.2 ***Non-metallic for electrical wiring***

Non-metallic conduits for electrical use shall conform to BE 9537 (Part – 3) – 1983 for rigid pipes and to BE 6946 – 1973 for flexible pipes. Fittings shall conform to BE 3419 – 1983. Bends shall be achieved by bending the pipes by inserting suitable solid or inspection type normal bends, elbows or similar fittings.

4.0 BRICK AND STONES

4.1 *Bricks :*

Bricks for masonry in foundations, load bearing walls and other locations shall be Heavy duty burnt clay building bricks having minimum crushing strength of T N/sq.mm or such other strength as may be described in the Schedule of items, when tested in accordance with IS : 1077-1992 Bricks in wall paneling and other minor works shall be common burnt clay building bricks having minimum crushing strength of 3.5 N/sq.mm as per IS 1077 : 1992. Bricks shall be sound, hard and thoroughly well burnt, with uniform size having rectangular faces with parallel sides and compact uniform texture. Bricks shall be of uniform deep red cherry of copper colour. They shall be free from flaws, cracks and nodules of free lime. Water absorption after 24 hours immersion in coldwater shall be as specified in relevant codes. They shall emit a clear metallic ringing sound when struck by a mallet and shall not break when dropped on their face, from a height of 60 cm. Fractured surface shall show homogenous, fine grained uniform texture, free from cracks, air holes, laminations, grits, lumps of lime, efflorescence or any other defect which may impair their strength, durability, appearance and usefulness for the purpose intended. Under burnt or vitrified bricks shall not be used. Samples of bricks brought to the site shall be tested periodically for compression and other tests according to IS 3495 (Parts 1 to 4) - 1992 “Method of Test for Burnt Clay Building Bricks”. Where the size of bricks is not specifically mentioned, it shall be taken to mean conventional sizes as is commonly available in the area. In case modular bricks are to be used, it shall be accordingly specified in Schedule of items. The bricks shall be classified on the basis of average compressive strength as given in table 1 of IS : 1077-1992 and 3.1 of IS : 2108-1988.

4.2 *Handling :*

Bricks shall be unloaded by hand and carefully stacked and all broken bricks shall be removed from the site.

4.3 *Samples and Inspection :*

Representative samples shall be submitted by the contractor and approved samples retained by the Project Consultants for comparison and future reference. Bricks shall be obtained from approved manufacturer. All bricks shall be subject to inspection on the site and shall be to the approval of the Project Consultants who may reject such consignment as are considered by him to be inferior to the quality specified. The Contractor shall provide all labour and plants required for the inspection and conduct such test as shall be required by the Project Consultants without additional charges.

4.4 *Solid Concrete Block:*

4.4.1 Solid concrete block shall be referred to by the nominal dimension, the term 'Nominal dimension' means that the dimension including the thickness of the mortar joint. Actual dimension shall be 10mm short or the 'Nominal' dimension (or 6mm short in special)

4.4.2 The nominal dimension of concrete block shall be as

follows: Length - 400, 500 or 600mm

Height - 200 or 100mm

Width - 50, 75, 100, 150, 200, 250 or 300mm

4.4.3 The nominal dimensions of the units are so designed that taking account of the thickness of mortar joints, they will produce wall length & height, which will confirm to the principles of modular co- ordination.

4.4.4 The maximum variation in the length of the units shall not be more than + or - 5mm and maximum variation in height and width of unit not more than + or - 3mm.

4.4.5 Face shell and webs shall increase in thickness from the bottom to the top of the unit depending upon the core model used. The face shells and webs shall be flared and tapered or straight tapered, the former providing a wider surface for mortar. The thickness of the face shall and web shall not less than the value given in table-1 .

4.5 MATERIALS:

4.5.1 ***Cement :***
Cement complying with any of the following Indian standards may be used at the discretion of the manufacturer:

IS heat Portland cement	:	269-1976 specification for ordinary and low (third revision).
IS cement (third revision)	:	455-1976 specification for Portland slag
IS pozzolana cement	:	1489-1976 specification for Portland (second revision).
IS hardening Portland cement	:	8041-1978 Specification for rapid
IS Portland cement	:	8042-1978 Specification for White
IS hydrophobic Portland cement	:	8043-1978 Specification for

4.5.1.1 When cement conforming to IS: 269-1976* is used, replacement of cement by fly ash conforming to IS: 3812 (part-I) 1966 may be permitted up to a limit of 20 percent. However it shall be ensured that blending of fly ash with cement is as intimate as possible, to achieve maximum uniformity.

4.5.2 **Aggregates -** The aggregates used in the manufacture of blocks at the mixer or the mixing platform shall be clean and free from deleterious matter and shall conform to the requirements of IS : 383- 1970.

4.5.2.1 The grading of the combined aggregates shall conform as near as possible to the requirements indicated in IS "383 - 1970. It is recommended that the fineness modules of the combined aggregate shall be between 3.6 and 4.00.

4.5.2.2 Fly ash conforming to IS 3812(part-I\!) -1996* may be used for part replacement of fine aggregate up to a limit of 20 percent

4.5.2.3 Water - The water used in the manufacture of concrete masonry units shall be free from matter harmful to concrete or reinforcement. or matter likely to cause efflorescence in the units and shall conform to the requirements of IS : 456-1798

4.5.3 **Additives or Admixtures** - Additives or admixtures may be added either as additives to the cement during manufacture, or as admixtures to the concrete mix. Additives or admixtures used in the manufacture of concrete masonry units may be:

a) accelerating, water-reducing and air entraining admixtures conforming to IS : 9103 – 1979

b) Fly ash conforming to IS : 3812 (Part – II) – 1966,

c) water proofing agents conforming to IS : 2645 – 1975 ; and

d) coloring pigments,

Where no Indian Standards apply, the additives or admixtures shall be shown by test or experience, to be not detrimental to the durability of the concrete

4.5.4 **MANUFACTURE:**

4.5.4.1 ***Mix***

4.5.4.2 The concrete mix used for blocks shall not be richer than one part by volume of cement to 6 parts by volume of combined aggregates before mixing.

4.5.4.3 In case of hand-moulded block where compaction is done manually, concrete mix should be sufficiently consistent to enable demoulding immediately after casting. The consistency of the mix should be such that it may cohere when compressed in the hand without free water being visible. Too little water causes the mix to be friable, while too much water causes difficulty in the immediate withdrawal of the mould.

4.5.4.4 In case of machine-moulded blocks, the web markings on the units as they come from the machine give a good indication as to whether the proper consistency of concrete has been used. In addition to the grading of the aggregate and the quality of cement, the amount of water required for mix will depend to an extent on the type of machine on which blocks are produced. It is possible to judge the proper consistency by squeezing a handful of concrete mixture When traces of moisture show on the outside of the squeezed mass it is usually considered to be suitable.

4.5.5 ***Mixing***

4.5.5.1 Concrete shall normally be mixed in a mechanical mixer.

4.5.5.2 Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency.

4.5.5.3 When hand mixing is permitted by the engineer-in-change, it shall be carried out on a water-tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. Ten percent extra cement may be added when hand-mixing is resorted to.

4.5.6 ***Placing and Compaction***

4.5.6.1 In the case of manual compaction, the mixture shall be placed into the mould in layers of about 50 to 75mm and each layer thoroughly tamped with suitable tampers until the whole mould is filled up and struck off level with a trowel.

4.5.6.2 In the case of mechanical compaction, the mould shall be filled up to overflow, vibrated or mechanically tamped and struck off level.

4.5.6.3 After demoulding the blocks shall be protected until they are sufficiently hardened to permit handling without damage.

4.5.7 ***Curing :***

4.5.7.1 The Blocks hardened in accordance with 4.5.6.3. shall then be cured in a curing water tank or in a curing yard (see Note), and shall be kept continuously moist for at least 14 days When the blocks are cured in an immersion tank, the water of the tank shall be changed at least every 4 days.

4.5.7.2 Steam curing of blocks hardened in accordance with 4.5.6.3., may be adopted instead of methods specified in 4.5.7.1 provided the requirements of pressure or non-pressure steam curing are fulfilled.

4.5.7.3 Drying - After curing the blocks shall be dried for a period of 4 weeks before being used on the work. They shall be stacked with voids horizontal to facilitate through passage of air. The blocks shall be allowed to complete their initial shrinkage before they are laid in a wall.

4.5.8 **SURFACE TEXTURE & FINISH:**

4.5.8.1 Concrete masonry units can be given a variety of surface textures ranging from a very fine close texture to a coarse open texture by the proper selection, grading and proportioning of aggregates at the time of manufacture. Textures may also be developed by treating the face of the units while still green by wire brushing or combing, by slightly eroding the surface by playing a fine spray of water upon it and by splitting (split block). Colour may be introduced by incorporating non-fading mineral pigments in the facing concrete or by applying a coloured cement grout or paint to the face of the units soon after they are removed from the moulds. Selected coloured aggregates may also be used in the facing and exposed by washing with water or dilute hydrochloric acid.

4.5.8.2 Well made concrete masonry may not require plaster in case of unimportant buildings in low rainfall areas: two or three coats of a cement paint being sufficient to render it resistant to rain water. If, however, it is intended to plaster concrete masonry, the block shall have a sufficiently rough surface to afford a good key to the plaster. Water proofing admixtures may be used for preparing the plaster.

4.5.9 **PHYSICAL REQUIREMENTS:**

4.5.9.1 General : All units shall be sound and free of cracks or other defects which interfere with the proper placing of the unit or impair the strength or performance of the construction. Minor chipping resulting from the customary methods of handling during delivery, shall not be deemed grounds for rejection.

4.5.9.2 Where units are to be used in exposed wall construction, the face or faces that are to be exposed shall be free of chips, cracks, or other imperfections, except that if not more than 5 percent of a consignment contains slight cracks or small chippings not larger than 25mm, this shall not be deemed grounds for rejection.

4.5.9.3 Dimensions : The overall dimensions of the units when measured as given in Appendix A shall be in accordance with 3 subject to the tolerances mentioned therein.

4.5.9.4 Block Density - The block density, when determined as in Appendix 8, shall conform to the requirements given in 4.

4.5.9.5 Compressive Strength - The minimum compressive strength at 28 days being the average of eight units, and the minimum compressive strength at 28 days of individual units, when tested in the manner described in Appendix C, shall be as prescribed in Table 2.

4.5.9.6 Water Absorption - The water absorption, being the average of three units, when determined in the manner prescribed in Appendix D, shall be not more than 10 percent by mass.

4.5.9.7 Drying Shrinkage - The drying shrinkage of the units when unrestrained being the average of three units, shall be determined in the manner described in Appendix E, and shall not exceed 0.1 percent.

4.5.9.8 Moisture Movement - The moisture movement of the dried blocks on immersion in water, being the average of three nits, when determined in the manner described in Appendix F, shall not exceed 0.09 percent

4.5.9.9 ***Tests :***

4.5.9.10 Tests as described in Appendices A to F shall be conducted on samples of units selected according to the sampling procedure given in 4.5.10, to ensure conformity with the physical requirements laid down in 4.5.9.

4.5.10 **SAMPLING :**

4.5.10.1 The blocks required for carrying out the tests laid down in this standard shall be taken by one of the methods given in 4.5.10.2 and 4.5.10.2. In either case, a sample of 20 blocks shall be taken from every consignment of 5,000 blocks or part thereof of the same size and same batch of manufacture. From these samples, the blocks shall be taken at random for conducting the tests.

4.5.10.2 The required number of blocks shall be taken at regular intervals during the loading of the vehicle or the unloading of the vehicle depending on whether sample is to be taken before delivery or after delivery. When this is not practicable, the sample shall be taken from the stack in which case the required number of blocks shall be taken at random from across the top of the stacks, the sides accessible and from the interior of the stacks by opening trenches from the top.

4.5.10.3 The sample of blocks shall be marked for future identification of the consignment it represents. The blocks shall be kept under cover and protected from extreme conditions of temperature, relative humidity and wind until they are required for test. The tests shall be undertaken as soon as practicable after the sample has been taken.

4.5.10.4 ***A Number of Tests***

4.5.10.4.1 All the 20 blocks shall be checked for dimensions and inspected for visual defects. (see 4.5.9.1 and 4.5.9.2).

4.5.10.4.2 Out of the 20 blocks, 3 blocks shall be subjected to the test for block density (see 4.5.9.3), 8 blocks to the test for compressive strength (see 4.5.9.4), 3 blocks to the test for water absorption (see 4.5.9.5) and 3 for moisture movement. The remaining 3 blocks shall be reserved for retest for drying shrinkage and moisture movement if a need arises

4.5.11 **MANUFACTURER'S CERTIFICATE :**

4.5.11.1 The manufacturer shall satisfy himself that the masonry units conform to the requirements of this specification and, if requested, shall supply a certificate to this effect to the purchaser or his representative.

4.5.12 **INDEPENDENT TESTS :**

4.5.12.1 If the purchaser or his representative requires independent tests, the samples shall be taken before or immediately after delivery, at the option of the purchaser or his representative and the tests shall be carried out in accordance with this specification.

4.5.12.2 The manufacturers shall supply free of charge the units required for testing.

4.6 *STONE (Granite, Trap, Sandstone, Quartzite, Etc.,)*

4.6.1 Stone used shall be strong, durable, dense, compact, close grained, homogeneous, fire resistant and shall be obtained from sources approved by Project Consultants. Stones shall additionally be hard, sound, free from cracks, decay and other flaws or weathering and shall be easily workable. Stones with round surfaces shall not be made use of.

4.6.2 Stones shall have a crushing strength of not less than 200 kg/cm^2 Stones with lesser crushing strength may be used in works with prior approval of the Project Consultants. Stones shall be non-porous and when tested in accordance with IS: 1124-1974 "Method of Test for Determination of Water Absorption Etc", shall show water absorption of less than 5% of its dry weight when soaked in water for 24 hours. Tests for durability and weathering shall be done in accordance with IS 1126-1974 and IS 1125-1974 respectively. The working of stones to required sizes and their dressing shall be as per IS: 1127-1970 "Recommendations for dimensions and workmanship of natural building stones for masonry works" and IS: 11291972 "Dressing of Natural Building Stones". Stones especially limestone and sand stones shall be well seasoned by exposure to air before use in construction works.

4.6.3 ***Size***

Normally stones shall be of size that could be lifted and placed by hand, between 20 to 30 kg per piece. The length of stones shall not exceed 3 times the height and the breadth on base shall not be greater than $^3/_4$of the thickness of wall or less than 15 cm. The height of stone may be up to 30 cm.

4.6.4 ***Dressing :***

4.6.4.1 Random Rubble :

Stones shall be hammer dressed on the face, the sides, and the beds to enable it to come into close proximity with the neighboring stone. The bushings in the face shall not project more than 4cm on all exposed faces, and 2 cm on a face to be plastered, nor shall it have depressions more than 1 cm from the average wall surface.

4.6.4.2 *Coursed rubble - First sort*

Face stones shall be hammer dressed on all beds, and joints, so as to give them approximately rectangular block shape. These shall be squared on all joints and beds. The bed joint shall be rough chisel dressed for at least 5cm back from face, and side joints for at least 4 cm such that no portion of the dressed surface is more than 6mm from a straight edge placed on it. The bushing on the face shall not project more than 4 cm as an exposed face and one cm on a face to be plastered. The hammer dressed stone shall also have a rough tooling for a minimum width of
2.5 cm, along the four edges of the face of the stone, when stone work is exposed.

4.6.4.3 *Coursed rubble - Second sort*

Dressing shall be as specified in 5.6.4.2 except that no potion of dressed surface shall exceed 10 mm from a straight edge placed on it as against 6 mm for first sort.

4.6.4.4 *Stone for veneering*

Stone lining up to 8 cm shall be treated as veneering work. The stone shall be cut into slabs or required thickness along the planes parallel to the natural bed. Every stone shall be cut to the required size and shape so as to be free from any waviness and to give truly vertical and horizontal joints. Adjoining faces shall be fine chisel dressed to a depth of 6 mm, so that when checked with a 60 cm straight edge, no point varies from it by more than 1 mm. All edges shall be chisel dressed to be true, square and free from chippings. Top and bottom faces shall be dressed to within 3mm tolerance and vertical faces to within 6 mm tolerance, when checked with a 60 mm straight edge. Dressing at the back shall not be done

4.7 *Cement, Lime and Water*

Cement, lime and water shall conform to the specification under the Section Concrete of this part.

4.8 *Sand for masonry Mortar*

Sand for masonry mortars shall be natural sand, crushed stone sand or crushed gravel and shall comply with IS 2116-1980 "Sand for Masonry Mortars". The sand shall be hard, durable, clean and free from adherent coatings and shall not contain amount of clay, silt and fine dust not more than 5% by weight. Sand shall not contain any harmful impurities such as iron pyrites, alkalis, salts, coal, mica and organic matters, The particle size grading of sand for use in mortars shall be within the limits as specified in Table 1 of above code.

5.0 SAND FOR PLASTERING

Sand for use in mortars for internal wall, ceiling and external plastering and rendering shall conform to BE 1542- 1992. It shall not contain any harmful impurities such as iron pyrites, alkalis, salts, coal, mica and organic matters. Percentage of salt and dust shall not be more than 5% by weight. Grading of sand shall be within the limits specified in clause No.5.1 of above code. Fineness modulus of naturally occurring sand shall not be less than 1.5.

6.0 MATERIALS FOR FLOORING & PAVING

6.1 Cement and Binders

6.1.1 Cement

Cement, fine aggregates, reinforcement and water shall comply with the requirements of concrete as per clauses 2.1, 2.3, 2.5 and 2.7 of this part.

6.1.2 *Water*

Water for construction shall be clean, soft, free from loam, salt and organic materials Hard water shall not be used.

6.2 Aggregates

6.2.1 Coarse Aggregate :

6.2.1.1

oarse aggregate shall conform to the requirement as per clauses 2.1 and 22 of this part.

6.2.1.2

or granolithic floor the screed shall comprise of aggregates size 15 mm and down graded and topping shall comprise of clean fine stone chippings, size 4 mm and down. For concrete floor with hardener treatment the topping shall comprise of stone chippings, size 5 mm and down and for in-situ terrazzo flooring, chippings shall be within sizes 12 mm to 6 mm graded. The marble chips for topping of terrazzo floor shall be of 3-6 mm size and shall conform to Grade-I of IS 2114-1984 "CP for laying in-situ terrazzo floor finish"

6.2.2 *Rubble :*

Rubble of approved quality shall be used and shall be clean and free from dirt. The loose and weathered sections shall be removed before use. Rubble used as hard core shall have a least lateral dimension (thickness) between 100 mm and 225 mm, depending on the thickness of hardcore.

6.2.3 *Pigments*

Pigments incorporated in mortar or used for grouting shall be subject to approval of Project Consultants and as per table 1 of IS: 2114-1984

6.2.4 *Dividing Strips :*

Dividing strips shall be of aluminum, glass, brass or similar materials as specified in the schedule of item and of quality approved by the Project Consultants. Strips shall not be less than 1.5 mm thick unless otherwise specified penetrating to the full depth of the flooring. Aluminum strips when used shall

have protective coating of bitumen.

6.2.5 ***Mosaic Flooring :***

The type, quality, size, thickness, colour etc. of the tiles for flooring shall be as per the item description given in the Schedule of Quantities and of best quality. The contractor shall provide the Engineer with necessary sample for approval.

6.2.6 ***Ceramic tile flooring:***

Providing and laying 'V' group Ceramic Tiles of any colour with size of
300 mm x 300 mm and 6 5 mm minimum thick for flooring in required positions, laid on a bed of 1:4 cement mortar including neat cement float, all special required like round edge tiles, corner cups etc. filling joints with neat cement slurry mixed with pigment to match the colour of the tile in proportion mentioned by the manufacturer, curing and cleaning the tiles of cement and pigment spillage and splashes etc complete as per the direction of the Engineer In Charge Tiles shall confirm to IS 13753.

6.2.7 ***Glazed Tiles in Dadoing :***

Providing and fixing Glazed tiles of any colour with size of 300 mm x 200 mm and 6.5 mm minimum thick, for dado in required positions, on plaster of cement mortar 1:4 including filling joints with white cement slurry mixed with pigments of approved quality to match the colour of the tile colour as per the direction and approval of the Engineer In Charge, curing and cleaning the tile after fixing as per directions of the Engineer Charge.

6.2.8 ***Cuddapah Slab :***

Polished Cuddapah stone of specified thickness with machine cut edges shall be fixed in single piece on the kitchen platform or open shelves as directed. The stones shall be hand and wax polished.

6.2.9 ***Green Kota Stone :***

Stones shall be of approved quality, size and uniform thickness, edges shall be chisel dressed and the top surfaces shall be machine polished with joints running true and parallel from side to side. Stones should be laid on a bed of cement or lime mortar. The pattern of the flooring shall be as per the Architect's drawings.

7.0 TIMBER

7.1 General

All timber used for carpentry and journey works shall be new It shall be well seasoned by a suitable process confirming to BE 1141-1973 before being planed to the required sizes It shall be sound, straight, free from sap, radial cracks, decay, fungal growth, boxed heart, pitch pockets, borer holes splits, loose knots, flaws, or any other defects and shall show a clean surface when cut Timber shall confirm to the requirements of IS 1003 (Part 1 &2) - 1983 to 1991. The finished components shall be given suitable preservative treatment wherever necessary.

7.2 Teak Wood/Sal/Beja Sal/Deodar/Kail and other varieties

7.2.1 **Teak Wood**

The Timber shall be of good quality and well seasoned it shall be of fairly uniform co lour and shall be free from defects such as cracks, dead knots, shakes etc. No individual hard and sound Knot shall be more than 15 SOM in size and aggregate area of all such knots shall not exceed 2% of the area of the piece. Wood shall be generally free from sapwood but traces of the same shall be allowed. The timber shall be fairly grained having not less than 2 growth per cm width in cross section.

7.2.2 ***Sal/Bija Sal Wood***

The timber shall be of good quality and well seasoned it shall be of fairly uniform colors reasonable straight grains and shall be free from all defects as mentioned in previous clauses. No individual hard and sound knots shall be more than 6 SOM in size and aggregate area of all such knots shall not exceed 2% of area of the piece. There shall not be less than 5 growth rings per 2 cm of the width.

7.2.3 ***Deodar Wood***

The timber shall be of good quality and well seasoned it shall be of fairly uniform color reasonable straight grains and shall be free from all defects as mentioned in previous clauses. No individual hard and sound knots shall be more than 15S0M in size and aggregate area of all such knots shall not exceed 2% of area of the piece. There shall be at least 3 growth rings per cm width in cross section.

7.2.4 ***Kail Wood***

The timbers shall be generally as specified in clause 7.2.3 for deodar wood. However there shall not be less than 2 growth rings per cm width in cross section

7.2.5 ***Other varieties/Imported Timber***

Other varieties like Champ, Matti, and Nandi shall also be used it shall be well seasoned and generally free from defects such as dead knots, cracks, shakes, sap wood etc., However traces of sap wood shall be allowed and sound and hard knots up to 2% of the area of the piece shall be allowed.

7.3 Storage & Inspection

Timber shall be carefully stored and subject to inspection on site piece by piece the Project Consultants may reject such pieces as are considered by not of the quality or meeting the requirements specified herein.

7.4 Moisture content

Timber shall be accepted as well seasoned if its moisture content does not exceed the permissible limit as per IS : 287-1973

7.5 Allowance for Timber

For timber allowances as specified in IS 1003 (Part 1 &2) --1983 - 1991 shall be applicable.

7.6 Flush Door Shutters, Shelves

Flush door shutters, shall be wooden. solid core or cellular and hollow core type, as may be shown in drawing or described in the Schedule of Items or directed by Project Consultants. They shall be obtained from an approved source of manufacture, covered on face with commercial ply wood veneer or other finish as may be necessary. Solid core shutters shall conform to IS: 2202 (Part 1 & 2) -1983-1991 and cellular or hollow core shutters to IS: 2191 (Part 1 & 2)- 1983.The resin used shall be phenol formaldehyde. A full size sample door shall be offered for inspection and approval.

7.7 Plywood for general purpose

Plywood for general purpose shall conform to BE 303-1989. Depending on adhesive used for bonding veneers, it is of 4 grades, BWP (boiling water proof), BWR (boiling water resistant). Any species of timber may be used for plywood manufacture. However list of species for the manufacture of plywood is given in Annexure' of the IS 303-1989 for guidance.

Plywood is classified in 10 different types as per appearance of the surface. These are types AA AB, AC, AD, BB, BC, BD, CC, CD, & DD as detailed in IS: 303 - 1984 it is available from 3 ply to 11 ply with thickness from 3mm to 25 mm.

7.8 Veneered decorative plywood

This quality of Ply wood shall confirm to IS: 1328 – 1982. These ply wood shall be of 2 Types Type - 1 & Type 2 as pre details given in IS: 1328 - 1982 species of timber for decorative face commonly used are given in Table 1 of IS: 1328 - 1982 but the purchaser shall specify the particular veneered to be used. Timber for cores and backs shall be either class-1 or class-2 as specified in IS: 303-1989. Adhesive used shall be BWR Synthetic resin.

7.9 Marine plywood

Marine grade ply wood shall be made out of select hard wood species treated with water soluble fixed type of wood preservatives under vacuum pressure in veneer form and shall confirm to IS: 710-1976.

7.10PVC Door shutter/ frames shall conform to IS specification.

8.0 *FITTINGS FOR DOORS, WINDOWS, ETC.,*

8.1General

Fittings shall be of brass colour coated aluminum or as specified. Hinges shall be of heavy duty and all other fittings shall be of medium duty. These shall be well made reasonably smooth and free from sharp edges, corners, flaws and other defects. Screw holes shall be counter sunk to suit the head of specified wood screws. All hinge pins shall be of steel and their riveted heads shall be well formed.

Brass fittings shall be finished bright oxidized or chromium plated and Aluminum fittings shall be finished bright or Anodized as specified. Fittings shall be got approved by the Project Consultants, before fixing screws used for fittings shall be of the same metal and finish as the fittings, however Anodized cadmium/chromium plated M.S Screws of approved quality shall be used for fixing aluminum fittings.

8.2 Hinges

8.2.1 **Butt Hinges**

These shall be brass butt hinges extruded Aluminum Alloy butt hinges or as specific six shall be specified in the drawing or Schedule of Items, Brass/Aluminum butt hinges shall confirm to the Indian Standard Specification for butt hinges ARE: 1341 - 1992 hinges shall be finished bright or satin polish or anodized.

8.3 Sliding Door Bolts

Non ferrous metal sliding doors, bolts are of Brass or Aluminum alloy and shall conform to IS 2681 - 19i'9 Brass sliding bolts are of 150-450mm size with bolt dia being 16mm for 150 _ 300 mm and 18mm for 375 &450 size Aluminum alloy sliding bolts are of size 200 _ 450 mm with 16mm bolt dia brass quality is finished satin polished or plated and aluminum bolts are anodized for Non-ferrous metal bolts the size of the sliding bolt is determined by the length of the bolt.

8.4 Tower bolts

Tower bolts may be of one of the following types and shall confirm to IS 204 (Part 1 &2) 1991 &1992.

I) Barrel Tower Bolts

These shall be of brass barrel tower bolts with cast brass barrel and Rolled or drawn brass bolt / brass barrel tower bolt with barrel of extruded sections of brass and rolled or drawn brass bolt / brass barrel tower bolts with brass sheet barrel and rolled or drawn brass bolt Aluminium barrel tower bolts with barrel and bolt of extruded section of Aluminium alloy bolts and barrel anodized.

II) Skeleton Tower Bolts

These shall be of brass bright finished skeleton tower bolts with cast brass / extruded sections plate and staples and rolled or drawn brass bolt or Aluminum skeleton tower bolts with plates staples and bolt of extruded sections of Aluminum alloy - plate and staple anodized.

8.5 *Door Handles*

Door handles shall conform to IS-208 - 1987and shall be of 2 types Type - 1 IS brass / Aluminum or zinc alloy die casting and available In 75,100, 125,150 mm sizes. Type - 2 IS fabricated (brass/ Aluminum alloy) in 75, 100 & 125 mm sizes. The size of the handle shall be determined by inside (grip) size overall size and Internal depth of the handles shall be as

detailed in IS 208-1987.

8.6 *Mortise Locks and Rebated mortise Locks*

Mortise lock with latch and pair of lever handles shall have body of aluminum alloy or brass and shall be right or left handed as shown in the drawing or as directed by the Project Consultants it shall be of approved quality & shall conform to IS : 2209/6607-1976/1972. The Project Consultants shall approve the shape and pattern. The size of the lock shall be determined by its length the lock for single leaf door shall have plain face and that for double leafs door a rebated face. Lever handles with springs shall be mounted on plates and shall weigh not less than 0.5 kg /pair. These shall be of brass, finished, bright chromium plated or oxidized. The lock shall be of 65, 75 & 100 mm sizes

8.7 *Floor Door Stopper*

These are for the use of the door shutters of 30, 35,40 &45mm thickness. It is made of aluminum alloy/ brass with springs of phosphor bronze or hard drawn steel wire and tongue of aluminum/brass/nylon/plastic. The floor doorstoppers shall conform to IS-1823 - 1980 & shall be of double type and approved quality. Width of cover plate IS 40mm but its overall length is 140mm for 30 & 35mm thick shutter & 150mm for 40 & 45 mm shutters the body shall be cast in one piece and fixed to cover plate by brass screws. On the extreme end there shall be rubber cushion to absorb shocks. The extension of the doorstopper shall be in flush with floor and be finished bright/satin/chromium plated or anodized.

8.8 *Hooks and eyes*

These shall be of aluminum or hard drawn brass and shall generally conform to BE 207-1964.

8.9 *Window peg stays*

These shall be made of cast brass, aluminum; cast alloy or as specified. The stay shall be made from a channel section and shall be 300mm long with steel peg and locking bracket The peg stay shall have five holes to open the window in different angles The Project Consultants shall approve the shape and pattern of stays. The peg stay shall be minimum to mm thickness in case of brass and aluminum.

8.10 *Quadrant stays*

These shall be made of cast brass, aluminum alloy, as specified. The Project Consultants shall approve the shape and pattern. It shall way as specified

8.11 *Fan light pivots*

These shall be made of cast brass or aluminum alloy or as specified and shall generally conform to BE 1837-1966.

The pattern and the shape of the catch shall be as approved by the Project Consultants and the size and finish shall be as specified.

8.12 *Fan light catch*

These shall be made of cast brass; aluminum alloy or as specified and shall generally conform to BE 364-1993. Steel Springs of the catch shall be 090 mm dia, 6 coils, 12 mm internal diameter and 20 mm long. The pattern and shape of the catch shall be as approved by the Project Consultants.

MISCELLANEOUS ITEMS

8.13 *Putty*

The material shall be homogeneous paste and shall be free from dust and other visible

impurities. Putty shall conform to BE 419-1967 for woodwork.

9.0 *METAL DOORS, WINDOWS, VENTILATORS*

9.1 General

Materials used in the fabrication of doors, windows, and ventilators shall be of best quality and conforming to relevant Indian Standards.

9.2 Steel doors, Windows, Ventilators

Steel sections used for fabrication of doors, windows, and ventilators shall be standard rolled steel sections specified in IS 1038, IS 1977,IS 1361 or IS: 7452 year 1983, 1975, 1978 and 1990 respectively as appropriate or as specified in drawing and Schedule of Items. Rivets shall conform to BE 1148-1982.

9.3 Aluminium Doors, Windows, Ventilators,

9.3.1 Minimum average thick of anodizing (coating of anodizing) on all aluminium sections and fittings shall be 15 microns and shall confirm to IS 1868- 1983.

9.3.2 Testing of anodizing coat shall be in accordance with IS 5523 -1983.

9.3.3 PVC protected sheeting shall be used for anodized sections while fixing the frame of window to avoid damages, scratches etc.

9.3.4 Final fixing shall be done with the prior approval of the Engineer in charge.

9.3.5 ***Sections***

All the sections should confirm to Designation 63400 given in IS 737-1986 and according to the specification in the BOQ's sizes of the sections shall be used with the prior approval of the Engineer in charge.

9.3.6 ***Clips***

The clips used shall be of 0.70 mm thick anodized as specified in the BOO with the approval of the engineer in charge.

9.3.7 ***Nepron Gaskets***

The nepron gaskets used of shall be first and best quality and should be got approved from the Engineer in charge before using.

9.4 M.S. Bolts, etc.,

M.S.Bolts, nuts, screws, washers, peg stays and other mild steel fittings shall be treated for corrosion.

9.5 Hardware

Hardware and fixtures shall be as specified in the drawings or Schedule of Items. All hardware and fixtures shall be able to withstand repeated use. Door closers shall be suitable for doors weighting 61 – 80 kg, unless otherwise stated. Each closer shall be guaranteed against manufacturing defect for one year and any defect found within this period shall be rectified or the closer replaced free of charge. Concealed door closers shall be either floor mounted or transom mounted, suitable for installation with metal doors. It shall conform the performance requirements and endurance test state din IS : 3564 – 1985 Appendix – A.

9.6 Mastic

The mastic for caulking shall be of best quality, from a manufacturer approved by the Project

Consultants, In General the mastic for fixing of metal frames shall conform to BE: 1 081 - 1960 and I or as approved by the Project Consultants

10.0 GLASS

10.1 General

Plain ground frosted or roughcast wired glass shall be used as shown on the drawing or as specified in the schedule of items. It shall be procured from a reputed source of manufacture and be if the best quality all glass panes shall be free from flaws, specs, bubbles etc., glass panes shall be of thickness 3mm or more as required. Weight of 3mm thick glass pane shall not be less than 7.5Kg/SQM. The tolerance of glass panes, except wired glasses, in length and width shall be ~ 2mm for 3-6.3mm glass sheets. Tolerance in thickness of glass sheet shall be +/- 0.2mm for 3mm and 4mm the glasses and +/- 0.3mm for 4.8, 5.5 & 6.3 mm the glasses.

10.1.1 *Float Glass*

The float glass shall be of uniform thickness with distortion free surface and high optical clarity these shall be procured from approved manufacturers.

10.2 Plain Transparent Glass

Plain transparent glass for glazing and framing shall conform to BE: 2835-1987. it shall be free from flaws, specks, bubbles or distortions.

10.3 Ground or Frosted Glass

Glare reducing or heat absorbing glass shall be "Calorex" or approved equivalent and special care shall be taken to grind smooth and round off the edges before fixing.

10.4 Thickness

Glass shall have the following thickness, unless otherwise stated in the Schedule of Items or

drawings Upto 60 cms x 60 cms : 3 mm

-Do- of larger size : 4 mm and 4.8 mm

Sheet glass for doors : 5.5 mm

Rough cast wired : 6.4 +/- 0.4

mm

10.5 Inspection

All glasses shall be subject to inspection on the site. Glass found with defects shall be rejected. Samples submitted for inspection shall be selected so as to be representative of the consignment.

11.0 PAINTS

11.1 General

All paints, varnishes, distemper or other surface coating materials shall be of approved quality conforming to the appropriate Indian Standard, wherever such standard IS available, and be obtained from a manufacturer of repute. If there are more than one quality for one particular product, only first quality shall be used unless otherwise stated In the Schedule of Items.

11.2 Sampling & Testing

The Project Consultants may, at his discretion, require samples of paint to be tested. In such cases testing will be according to IS: 101 (part 1 -8) -1964-1993

11.3 Storage

Paints, primers, distempers and varnishes shall be delivered in sealed containers. They shall be stored in cool dry condition to the satisfaction of the Project Consultants

11.4 Paints for Priming

Ready mixed paints for priming coats of steel and ironwork shall either comply with IS: 2074-1992 "Ready Mixed Paint", "Red Oxide Zinc Chrome Priming" or Red Oxide metal primer as specified. For wood work it shall be pink/white wood primer as specified by the manufacturer of the synthetic enamel paints, conforming to IS : 3535-1966.

11.5 Paints for Finishing

Ready mixed oil synthetic enamel of approved manufacturers like Berger, Jenson 7 Nicholson, Shalimar, I.C.I., Asian, Garware and Good lass Nerolac paints only shall be used unless otherwise specified Paint shall be of first grade quality of the above manufacturers ie., Luxol, Brolac, Superlac, Dulax gloss, Apocolite, Garcoat and Nerolac respectively.
If for any other reason, thinning is necessary, the brand of the thinner recommended by the manufacturer, shall only be used with the specific permission of the Project Consultants.
Aluminium paint for general purpose shall be in Duel Containers It shall be of manufacturers as for synthetic enamel paints above.

11.6 White Wash

White Wash shall be prepared from freshly burnt fat, white in colour lime slaked on spot, conforming to IS : 712-1984 mixed and stored with sufficient water to make a thin cream Best and approved quality gum and ultra marine blue only shall be used in lime wash.

11.7 Cement Paint

Cement paints shall comply with IS:5410-1992 and shall be of approved brand and manufacture like Snowcem India Ltd., Berger, Jenson & Nicholson & Shalimar paints The shade shall be approved by the Project Consultants before its application.

11.8 Distemper

Acrylic/synthetic washable distemper of approved brand and manufacture like Berger, Jenson & Nicholson, Asian, Shalimar, Garware & Good lass Nerolac shall be used_ The shade shall be approved by the Project Consultants before application of the distemper and shall comply with IS:427-1965 and 428-1969

12.0 *WATER PROOFING MATERIALS*

12.1 Integral Cement water proofing compounds

Integral cement waterproofing compounds, i.e., admixture for waterproofing purposes shall comply with the requirements of IS : 2645-1975. Properties like permeability, setting time, compressive strength shall be in accordance with the requirements of this code when tested as per procedure laid therein. Calcium chloride content of the product used shall be made known to Project Consultants before use

12.2 Surface Application Materials

Waterproofing material for application on mortar or concrete surface shall conform to IS : 9862-1981. The primer shall be suitable for spray or brush application. It shall have properties enabling it to penetrate through pores or cracks and fill them up, making the surface

impervious.

12.3 Polymer based paints

The materials used shall be high polymer based chloride and sulphide free cement and waterproofing additions and epoxy based waterproofing paints as per manufacturer's specification and approved by Project Consultants.

13.0 LEAD

13.1 General

Lead for joints in cast iron spigot and socket pipes shall be melted from pure soft pig lead conforming to Type -I of IS:782-1978. "Caulking lead". Where lead wool is allow for caulking, it shall be equal to or better than Type-II of IS 782-1978. Lead flashing shall conform to IS : 405 Part I & II -1992, "Lead Sheet".

14.0 *DRAINAGE AND SANITATION (INTERVAL)*

14.1 General

All materials, pipes, specials, fittings, fixtures etc., to be used in works shall be of best quality and class specified in relevant IS Code. Where specified these shall be of specific manufacture and quality and shall be procured from manufacturer or their accredited stockiest and be marked with manufacturer's names and trade mark Contractor shall submit to the Project Consultants samples of all materials, pipes, specials, fittings, fixtures for approval before use in the works. Such approved samples shall be retained by the Project Consultants until completion of works. Pipes and specials may be any or combination of following types:-

I). PVC Pipes.

II) Stones Ware Pipes.

III) Sand Cast Iron Pipes for soil waste & Ventilation

IV) PVC Pipes for rainwater

V) R.C.C. Pipes.

14.1.1 HIGH DENSITY PVC PIPES AND FITTINGS

This shall conform to IS:4984-1987 and IS:8008 (Part 1 to 7) -1976 unless otherwise specified.

14.2 P.V.C. Waste Pipe

This shall conform to IS:4985-1988 unless otherwise specified

14.3 Stoneware Pipes & Fittings

All stoneware pipes, bends, gully traps and sewer traps shall be of the best salt glazed variety inside and outside, hard burnt dark grey colour, perfectly sound free from fire cracks and Imperfection of glaze, truly circular in cross section, perfectly straight of standard nominal length and depth of socket and barrel. These shall be of approved manufacture and shall comply with the requirement of 15:651-1992. These pipes shall be of grade AA unless otherwise specified

14.4 Sand Cast Iron Pipes & Fittings Conforming To IS : 1729-1979

All soil waste and vent pipes and fittings used in the work shall be cast Iron and shall conform to IS:1729-1979. The pipes shall have spigot and socket ends, with beads on spigot end and shall be with or without ears. The pipes shall be free from cracks and other flaws. The interior of the pipe and fittings shall be clean, smooth painted inside and outside with DR Angas smiths solution or other approved anti-corrosive paint

The standard weights and thickness of pipe shall comply with the requirements of IS : 17291979. The tolerance on wall thickness and weight shall be minus 10 percent and mlnus10 percent respectively. Pipes weighing more than the nominal weight given below may be accepted provided they comply in every other respect.

Weight per piece in Kg. exld. Ears

Nominal size	1500 mm	1800 mm	2000 mm
50	9.56	11.41	12.65
75	13.83	16.52	18.37
100	18.17	21.67	24.15
150	26.70	31.92	35.66

Specials and fittings shall include bends, offsets, branches of various types, Junctions etc as required for the work which shall be provided according to drawings and directions of the Project Consultants, B.M. trap shall have water seal as per I S provisions.

The specials and fittings shall be provided with access doors where so specified or directed by the Project Consultants. The access door fittings shall be of proper design so as not to form cavities in which the filth may accumulate Doors shall be provided with 3 mm thick rubber insertion packing, and when closed and bolted they shall be water tight. The access doors shall have MS studs and bolts or screws or bolts and nuts.

14.5 Sanitary appliances (I.W.C.)

Sanitary appliances like I.W.C/E,W,C pans, basin, urinals and sinks etc, shall be made of vitreous china or fire clay as specified. These shall be of Hindustan Sanitary ware or Parry ware make unless otherwise specified and to be approved by the Project Consultants These shall conform to A class quality of IS : 2566 (Part 1 to 15) -1972 to 1985 and IS 771 (Part 1 to 15) -1979-1985 respectively.

14.5.1 **INDIAN PATTERN W.C.**

Unless otherwise specified these shall comprise of :-

a) White glazed earthenware WC pan back entry type,

b) White glazed earthenware 'P' or 'S' trap with or without vent

c) PVC low level cistern of capacity 7/10 ltrs of approved brand like Slim

d) 35/40 mm 0.0 high density PVC flush pipe with holder bat clamps

e) One pair of white glazed earthen ware foot rest set in cement mortar 1:3

f) 15 mm PVC connection pipe with brass couplings at both ends and 15 mm brass stop cock.

14.6 Wash Hand Basin

Unless otherwise specified these shall comprise of. -

a) White glazed earthenware basin with 2 nos. MS angle Brackets with anticorrosive painting.

b) 1 no. 15 mm C.P. brass pillar tap

c) 32 mm C.P.brass waste fitting, CP.brass chain and rubber plug

d) 32 mm PVC waste pipe with brass couplings and 15 mm brass trap

e) 15 mm PVC connection pipe with brass couplings and 15 mm brass stop cock

14.7 Flat Back Lipped Urinal

Unless otherwise specified these shall comprise of :-

a) White glazed earthenware urinal basin back type

b) 25 mm dia CP brass flush pipe and spreaders with wall clips and brackets

c) 15 mm PVC connection pipe with brass couplings joint at both ends and 15 mm brass stop cock.

d) 32 mm C.P .brass outlets complete with PVC waste

Mirror Frames

Mirror shall be of superior glass with edges rounded off or beveled as specified It shall be free from flaws, specks or bubble and its thickness shall not be less than
5.0 mm. The glass for the mirror shall be uniformly silver plated at the back and shall be free from silvering defects. Silvering shall have a protective uniform covering of red lead paint.

14.8 Toilet Shelf

Ceramics shelf shall be of shape, size and design as specified in the Schedule of Items

14.9 Towel Rail

Towel Rail shall be of CP brass/anodized aluminium with two brackets of same material, diameter and length as specified.

14.10 Soap Container

Soap container shall be of C.P.brass, PVC with C.P.brass brackets of approved make and design.

14.11 CP Flush Vales for urinals

CP flush valve for urinal shall be of "Jaquar" brand of Jaquar & Co. 'ACCO' brand of Asian Continental Metallware Fabric of equivalent quality.

14.12 Gully Trap

Each gully trap shall have one C.I.grating 150 mm x 150 mm and one water tight precast R.C.Cover 300 x 300 x 40 mm thick with 1:1 1/2:3 mix concrete (one cement one and half sand:3 stone chips 20 mm down) including neat cement finish.

14.13 C.I. Manhole Cover and Frame

These shall be of light or medium duty (LD or MD) as specified In Schedule of Items and of cast iron with raised chequered design, lifting key and key hole and shall be coated with black bituminous base material. light duty covers and frames shall be of either rectangular type, single seal, pattern 1 and 2 having minimum weight of cover and frame 38 kg and 25 kg respectively or with double seal, minimum weight of cover and frame being 52 kg. These may be of square type also. Single seal with clear openings of 4550 and 610 mm with minimum weight of cover and frame being 20 kg and 38 kg respectively, double seal of same openings shall have minimum weight of cover and frame of 30 kg and 55 kg respectively Medium duty covers and frames shall be either of circular type with 500 and 560 mm clear openings and minimum weight cover and frame 116 kg and 128 kg respectively or of rectangular type with minimum weight of cover and frame 144 kg.

The C.I. manhole covers and frames shall conform to IS: 1726-1991.

15.0 *WATER SUPPLY & PLUMBING (INTERNAL)*

15.1 General

This section deals with the specification of material for pipes, fittings, fixtures etc, to be used in water supply works.
All materials, pipes, fittings, fixtures to be used in the works shall be of the best quality and of the class specified in various clauses herein under. Where specified these shall be of specific manufacture and quality and shall be procured from the manufacturer or their accredited stockiest and be marked with manufacturers name and trade marks The contractor shall submit to the Project Consultants samples of all pipes, fittings, fixtures for approval before used in the works. Such approved samples shall be retained by the Project Consultants until completion of works.

Pipes and pipe fittings may be of any combination of following types

i) Galvanized pipe.

ii) PVC pipes.

15.2 G. I. Pipes and Fittings,

Generally pipes for installation in buildings shall be medium quality malleable steel galvanized pipe 'B' class for cold water supply and 'C' class for hot water supply, having threaded ends with socket at one end. The details of standard medium quality "B" class pipes and sockets regarding nominal bore thickness and weight in kg/m are given below :-

Pipe Dia (Nominal bore)	*Dimension of Pipe*		*Thickness*	*Dimension of Ordinary sockets*		*Wt. of Pipe Plain end*
	Max Outside dia	*Min*		*Outside dia (Apporx.*	*Min Length*	
mm	*mm*	*mm*	*mm*	*mm*	*mm*	*Kg/M*
15	21.8	21.0	2.65	26.90	34	1.21
20	27.3	26.5	2.65	33.70	36	1.57
25	34.2	33.5	3.25	42.00	43	2.42
32	42.9	42.0	3.25	51.00	48	3.11
40	48.8	47.9	3.25	57.00	48	3.59
50	60.8	59.7	3.65	70.00	56	5.07
65	76.6	75.3	3.65	88.00	65	6.49
80	89.5	88.0	4.05	101.60	71	8.43

Note : Manufacturing tolerances shall be permitted on tubes and sockets in addition to above as per IS : 1239 (Part 1 & 2) – 1990 to 1992.

The galvanized iron pipes shall be of approved make and conform to IS : 1239
(Part 1 & 2) – 1990 to 1992 and of tested quality. The GI pipes shall be of threaded ends with a socket at one end only. The fittings for GI pipes shall be either galvanized wrought iron or galvanized malleable iron.

15.3 Bib Tap and Stop cock

Bib tap and stop cock for water services shall be of brass screw down type and shall conform to IS : 781. Minimum finished weight of big and stop taps shall be as given below :-

No. of Size (mm)	Bib taps (kg)	Stop tap (kg)
10	0.30	0.35
15	0.40	0.40
20	0.75	0.75
25	1.25	1.30
32	-	1.80
40	-	2.25
50	-	3.85

The taps shall be tested under internal hydraulic pressure of at least 20 kgf/cm2 and maintained at the pressure for a period of at least two minutes during which period it shall neither leak nor sweat.

15.4 Valves

Unless otherwise mentioned in the Schedule of Quantities these shall be copper alloy gate, globe and check valve of nominal sizes 8 to 100 mm and shall conform to IS : 778-1984. Valves shall be of class I and class 2, suitable up to a temp of
45 degree C and can sustain non shock working pressure up to 1.0 and 1.6 MPA respectively They shall have screwed or flanged ends. All the metal parts shall be of brass/brass alloy except hand wheel of Cast Iron or other approved quality.

15.5 Shower Rose

The shower rose shall be of heavy quality chromium plated brass with flat bottom, of diameter 100 mm or as specified with uniform perforations

15.6 Storage Tank

Storage Tank shall be R.C.C. or PVC of specified sizes, capacities, make, manufacture as specified in Schedule of Items. It shall have facilities for connecting inlet, outlet overflow and washout pipes and a top cover. Where tanks are to be fabricated by the Contractor the fabrication/R.C.C. detailed drawings shall be got approved by Project Consultants.

15.7 Miscellaneous Items

15.7.1 **HALF ROUND CHANNEL**
This shall be made of vitreous china channel with or without outlet/stop end as specified in Schedule of Items and shall be of approved manufacture.

15.7.2 **URINAL PARTITION**
This shall be made of vitreous china or marble as specified and shall be of approved make and quality.

16.0 *EXTERNAL SEWAGE & DRAINAGE*

Unless otherwise specified CI pipe and specials, caulking lead, SW pipe, RCC pipe shall conform to the following

16.1 C.I. Pipes

C.I. pipe shall conform to IS:1536-1989 or/and IS:1537-1976 of class as specified in Schedule of Items. C.I. pipe fittings shall conform to IS:1538 (Part 1 to 23) -1976 as specified In Schedule of Items. Bolts and nuts shall be hexagonal bolts and nuts conforming to IS :
1363 (Part 1 to 3) -1992.

16.2 Washers

Spring washers conforming to IS : 3063-1972 shall be used near the pumps to take care of vibration. In other places plain washers conforming to IS 2016-1967 shall be used.

16.3 Gaskets

Gaskets shall be reinforced rubber sheet or compressed fibre board conforming to ISG38 1979 of thickness between 1.5 mm to 3 mm as specified.

16.4 Caulking Lead

Lead for the spigot and socket joints shall conform to IS 782-1978

16.5 Salt Glazed stoneware Pipes

Salt glazed stone-ware pipes used shall conform to IS:651-1992 and shall be laid as per IS:4127-1983. The pipes shall be of grade M unless otherwise specified.

16.6 Steel Pipes

These shall be of medium or heavy duty (M.D. or H.D) as specified in Schedule of Items and of Cast Iron with raised chequered design, lifting key and key hole and shall be coated with black bituminous base material. Medium duty covers and frames shall be either of circular type with 500 mm clear opening and minimum weight of cover and frame 116 kg and 128 kg respectively or of rectangular type with minimum weight of cover and frame 144 kg.

Heavy duty covers and frames shall be either of circular type with clear openings of 500 and 560 mm and 170 and 208 kg weight respectively or of double triangular type with clear openings of 500 and 560 mm and 229 and 255 kg weight respectively

The CI manhole cover and frames shall conform to IS: 1726-1991.

16.7 Galvanized Steel Barbed Wire for fencing

These shall be of two types A & B. In both types Barbs shall have 4 points formed by twisting two point wires, each two turns. In type A (Iowa type) twisting IS done around both line wings and in Type B (glidden type) around one line wire, in both cases making altogether four complete turns. It shall conform to IS:278-1978 and shall have the diameter of line and point wire as described in Schedule of Item. Galvanised mild steel wire shall conform to IS 280-1978.

Line and point wire shall be circular in section, free from scales and shall be uniformly galvanised. Line wire shall be in continuous length and sf1all not contain any welds other than those in rod before it is drawn.

17.0 *APPROVED BRAND AND/OR MANUFACTURE'S NAME FOR SOME OF THE IMPORTANT MATERIALS*

Unless otherwise specifically mentioned in the Schedule of Items, Contractor has to use materials as listed below, of only these brand names/Company's names, which are mentioned in the approved list for civil, water supply and sanitary items thereon.

A. BUILDING MATERIALS

01.	Reinforcement Steel	**Sail, Tisco, Vizag Steel or equalant**
02.	Cement	**Birla, ACC, Coramandal, Rajshree, Zuari or equalant**
03.	Flush Doors	**Kanara wood & plywood industries Western Indian Plywood or equalant**
04.	Plywood, Block board	**Kanara wood & plywood Industrial Western India Plywood or equalant**
05.	Particle board	**Novopan, Bhutan-board, Eco board Bombay Busmah Trading Corporation or equalant**
06.	Factory made wooden panel door & windows	**Indian wood & wood products (Mangalore) Touch wood, Parvathi wood Industries, Anand wood crafts (Secunderbad) or equalant**
07.	Decorative laminates	**Decolam, Formica, Rammica or equalant**
08	Aluminium hardware fittings	**Jyoti, Crown, Ajantha or equalant**
09.	M.S. Doors, Windows, ventilators	**Deepak windows, Deccan Structural, basic Arch products, Perfect Industries or equalant**
10.	Admixture, Water Proofing Compounds	**Roofe, Fosroc, Sika or equalant**
11.	Water proof cement paints	**Super snowcem, Berger, Jenson & Nichol son, Shalimar mysore paints, ICI. or equalant**
12.	Distemper paints Emulsion paints Enamel paints	**Asian paints, ICI, Berger Jenson & Nicholson, Shalimar or equalant**
13	Door Closers	**Evertie, Gloster, Engineering, Amar, A.K.Industries, Hardiwyn, vigvijy, Dewan Industries or equalant**
14.	Sealants	**GE Silicon, Bostick or equalant**
15.	Solar water heater	**Enolar, Tata BP Solar, MSIL. or equalant**

SANITARY AND WATER SUPPLY WORK (INTERNAL) (FIRST QUALITY TO BE USED)

01. Cast Iron Pipes and Fittings — Hindustan Engineering products Company Calcutta, E.LC., Standard approved manufacturers of any other brand of fittings having ISI marking Sudarshan pipes, Sri Krishna concrete products **or equalant**

02. R.C.C. Pipes — Indian hume Pipe Company, Delhi **or equalant** Allahabad/Chandigarh/Lucknow, Hindustan Pressure Pipes, Kolhapur, Dhere Concrete products, Pune or any other approved manufacturer conforming B I S Standard

03.	G.I. pipe	Indian Tube Company, Calcutta; kalinga Tubes limIted, Cuttack; Gujarat Steel Tube; Zenith Tube Co Kolaba; Bharat Steel Tube, New Deihl. Jindal, Shivmoni Steel Tubes Limites, Bangalore, Sekhar Iron Works, Calcutta; Jain Tubes, Ghaziabad; Khandewal Tubes, Nagpur, Prakash Surya **or equalant**
04	G.I Fittings	International Pipe Woks, Calcutta; R. M Engineering Woks, Jalandhar; Bombay Metal Conwany, Bombay·, Tarapada oas & sons, Howrah, Annapurna Metal Works, Calcutta or equalant
05.	Gun Metal valves and Copper Alloy Valve	Leader Engineering Works, Jalandhar; Neta Engineering Works, Jalandhar; Lakshml Metal Works, Jalandr1ar: Bombay Metal & Alloys, Bombay, Luster Sanitary Fittings, jalandhar Annapurna Metal Works, Calcutta. **or equalant**
06.	Sluice Valves, Check Valves etc.	Shiva Durga Iron Works, Howrah; Leader Engineering Works, Jalandhar; Kirloskar Bros . Limited, Pune, Indian Valve, Calcutta; Geeta Iron & Brass Works, Baroda. **or equalant**
07.	Brass Fittings	Leader Engineering Works, Jalandhar; L& K Mathura, Luster Sanitary, Jalandhar; Annapurna Metal Works, Calcutta; Neta Metal Works, Jalandhar; Honey Industrial Coporation, Bombay. **or equalant**
08.	C.P. Fittings 66	Ego Metal Works, ballabhagarh; Jaquar Industries, Delhi; Soma Plumbing Fixtures Limited, Calcutta; Gem SanItary Appliances PvtLtd., Delhi; Essco Sanitations, Delhi; Bllmet. Bombay **or equalant**
09.	W.C.Pan, Wash basin, Urinals, Sink, Low down Flushing Cistern	E.ID Parrys. Madras; Hindustan Sanitaryware, Calcutta **or equalant**
10.0	Mirrors	Atul Glass Works, Vallabh Glass Works, Goldenfish **or equalant**
11.0	White Glazed tiles	H & R Johnson Tiles Company, Bombay, Somani Pikingtons & Co., Haryana, Naveen Tiles (Murudeshwara Ceramics Ltd) Bengaluru **or equalant**
12.0	Stone Ware (Salt-Glazed) Pipes	Hind Ceramics Ltd., Orissa; Ceramic Industries Ltd., Sabbalpur; Shrikamakshi Agencies, Madras, Binary Udyog Pvt. Ltd., Howrah; Tirumathi Moulds Limited, Nagpur, Kiran Potteries, Hyderabd, Perfect Sanitary Pipes, Bharatpur. **or equalant**
13.0	PVC WATER TANKS	Infra, Sintex, ICP **or equalant**
14.0	PVC Pipes	Supreme, Infra, Prince, Finolex **or equalant**

18.0MATERIALS NOT SPECIFIED

Any materials not fully specified in these specification and which may be offered for use in the works shall be subject to approval of Project Consultants, without which it shall not be used anywhere in the construction works.

SPECIFICATION FOR CIVIL WORKS

PART – II

WORKMANSHIP

CONTENTS

1. **GENERAL :**

   1.1 Standard,

   1.2 Supervision

   1.3 Temporary Works,

   1.4 Codes

   1.5 Base Lines and Bench marks

   1.6 Setting out

   1.7 Dewatering

   1.8 Safety of Existing Work

   1.9 Protection of Existing services

   1.10 Handing over of Work Site

2. **EARTH WORK :**

   2.1 Scope

   2.2 General

   Setting out

   2.4 Site Clearance and Demolition

   2.5 Classification of Soil

   2.6 Method of Excavation

   2.7 Excavation of Soils Other than Hard Rock

   2.8 Excavation in Hard Rock

   2.9 Cutting and Filling for Site Levelling

   2.10 Excavation of Trenches

   2.11 Excavation for Foundations

   2.12 Excess Excavation

   2.13 Disposal of Excavated materials

2.14 Back filling of Treches

2.15 Back Filling of Foundations

2.16 Filling Under Floors

2.17 Load bearing Fills

3. ANTI TERMITE TREATMENT

3.1 Scope

3.2 Execution

3.3 Acceptance Criteria

4. CONCRETE (PLAIN & REINFORCE)

4.1 Scope

4.2 Materials

4.3 Grades of concrete

4.4 Mix Design

4.5 Water Cement Ratio

4.6 Workability

4.7 Durability

4.8 Trail Mixes

4.9 Nominal Mix Concrete

4.10 Volumetric Mix Concrete

4.11 Batching of Concrete

4.12 Water

4.13 Mixing and Transporting of Concrete

4.14 Preparatory Works/Surface Preparation

4.15 Placing and Compaction of Concrete

4.16 Construction Joint & Cold Joints

4.17 Finishes to Exposed Surfaces of Concrete

4.18 Curing of Concrete

4.19 Testing of Concrete

4.20 Steel Reinforcement

4.21 Shuttering

4.22 Damp Proof Course Concrete

4.23 Concreting in Water Retaining Structures

4.24 Application of Live Load

5. MASONRY

5.1 General

5.2 Materials

5.3 Selection of Mortars

5.4 Cement Mortar

5.5 Brick Work

5.6 Solid Block

5.7 Stone Masonry

6. PLASTERING AND POINTING

6.1 Materials

6.2 Plastering

6.3 Cement Pointing

6.4 Rough Cast Concrete Facing

6.5 Punning with Lime or Plaster of Paris

7. FLOORING, PAVING & FACING

7.1 Scope

7.2 Materials

7.3 Sub-base

7.4 Sub-grade

7.5 Cement Concrete Flooring with Integral Finish

7.6 Concrete Flooring with Granolithic Finish (Artificial Stone Flooring)

7.7 Dado & Skirting Work (Grey Cement Skirting/Dado)

7.8 Acceptance Criteria

7.9 Precast Mosaic Tile Flooring

7.10 Precast Mosaic tiles in skirting, dado and risers

7.11 Ceramic tile flooring

7.12 Mortar Bedding

7.13 Glazed Tiles in Dadooing

7.14 Cuddapah stone

7.15 Green Kota Stone flooring

7.16 Green Kota Stone skirting

7.17 Green Kota Stone shelves

8. WOOD WORK

8.1 General

8.2 Joinery

8.3 Shrinkage & Tolerance

8.4 Fixing

8.5 Tarring

8.6 Fittings

8.7 Doors

8.8 Panelled Shutters

8.9 Glazed Shutters

8.10 Flush Door Shutters

8.11 Hand rail and Fittings

8.12 Inspection

9. METAL DOORS, WINDOWS,

9.1 General

9.2 Fixing

9.3 Fittings

9.4 Normal Steel Plate Doors

9.5 Pressed Steel Doors

9.6 Steel Windows, Sashes, Ventilators, etc.,

9.7 Collapsible Gate (Steel)

9.8 Aluminium Windows

10. Glazing

10.1 General

10.2 Doors, Windows and Ventilators

11. WHITE WASHING, COLOUR WASHING & PAINTING

11.1 Scope

11.2 Materials

11.3 White Washing

11.4 Cement Primer Coat

11.5 Water Proof Cement Paint

11.6 Oil Bound Distemper

11.7 Painting to Timber & Steel Surface

12. INTERNAL WATER SUPPLY, PLUMBING, DRAINAGE AND SANITATION

12.1 Scope of Work

12.2 Water Supply & Plumbing

12.3 Drainage and Sanitation (Internal)

13. EXTERNAL SEWERAGE & DRAINAGE

13.1 Scope of Work

13.2 Materials

13.3 Excavation of Trenches and pits

13.4 Cast iron Pipes

13.5 Stoneware Glazed Pipelines (S W G)

13.6 Manholes

13.7 Marker Plates

14. WATER PROOFING

14.1 Scope

14.2 Materials

14.3 General Workshop

14.4 Surface Application

14.5 Guarantee

15. MISCELLANEOUS

15.1 Expansion and Isolation Joints

15.2 Barbed Wire Fencing

15.3 Chain Link Fencing

1. GENERAL :

1.1 Standard,

A high standard of workmanship in all trades will be required. The Contractor shall ensure that only skilled and experienced workmen are employed.

1.2 Supervision

The Contractor's supervising staff shall be fully qualified and experienced in the types of work being carried out under their supervision and shall be capable ensuring that work IS executed efficiently and as per specification.

1.3 Temporary Works,

Where required, the Contractor shall furnish such details of his temporary works as may be called for by the Project Consultants and The Contractor snail satisfy the Project Consultants as to their safety and efficiency. The Project Consultants may direct that temporary works, which he considers unsafe or insufficient, shall be removed and replaced in a satisfactory manner.

Codes

The years of publication against various standards, referred in this specification, correspond to the latest standards as on date of this specification. During use of this specification in future, the latest publication as on date shall be referred to. Where the BIS or IRC does not yet publish standards, adoptable British Standards or other International Standards shall apply. Incase of any conflict in meaning between these specifications and those of BIS or IRC, or British /International Standards, the provisions of these specifications shall prevail.

1.5 Base Lines and Bench marks

The Contractor shall establish and maintain, to the satisfaction of Project Consultants, the base lines and benchmarks, based on which the works are set out. Where such base lines and benchmarks are provided by the Project Consultants, the Contractor shall maintain these throughout the period of construction without causing any disturbance to them.

1.6 Setting out

The Contractor shall set out all the works to be executed by him, in line with the standard base lines, levels, position and benchmarks and truly as per drawings within the accepted tolerance limits at no

extra cost to Owner. The Contractor shall be solely responsible for the setting out or all the works, to be executed by him and the approval of such setting out by the Project Consultants shall in no way absolve the Contractor his responsibility for carrying the work to tile true lines, levels and positions as per drawings

1.7 Dewatering

The Contractor shall carryout all the works, in dry and workable condition and maintain the same in dry condition till the final handing over of works at no extra cost to the Owner. For this the Contractor shall make all the necessary provisions of dewatering, wherever necessary, to the satisfaction of the Project Consultants.

1.8 Safety of Existing Work

Before taking up any construction adjoining other property or existing work, the Contractor shall take all steps necessary for the safety protection of such property or work at no extra cost to the Owner.

1.9 Protection of Existing services

The Contractor shall take all precautions necessary to prevent damage or interference with underground or over ground services such as cables, drains, piping or piles, whether shown on drawings or not. Equipment. Mounted in position shall be protected against falling debris etc., by means of tarpaulin or such other material at no extra cost to the Owner

1.10 Handing over of Work Site

On the completion of work, the Contractor shall remove all rubbish, debris, surplus materials, temporary work etc from the site. The site shall be handed over in a tidy and workmanlike manner at no extra cost to the Owner.

2. EARTH WORK :

2.1 Scope

This chapter deals with earthwork and excavation for civil works in site, formation / over site levelling, foundations, cutting and grading for roads/ pavements and railways, canals, embankments other buried services and the like.

2.2 General

The Contractor shall carry out the excavation strictly to the lines and levels, in conformity with the drawings or instructions of the Project Consultants.

2.3 Setting out

Before commencement of earthwork block levels of existing ground shall be taken by the Contractor jointly with the Project Consultants, plotted and signed in token of acceptance of

ground levels. Excavation shall not be commenced until the initial ground levels have been recorded and accepted. Reference lines, benchmarks and base lines shall be set out by the Contractor for control of earthwork operation. Setting out shall be done with pegs, blocks, bamboo poles or rails, marking boundaries or centerlines, as the case may be, and the same maintained for reference and future checking. Chain age stones at regular intervals shall be set up for embankments. All setting out operations shall be got checked and approved by Project Consultants. However, such checking and approval by the Project Consultants shall in no way absolve The Contractor of his responsibilities for carrying out the work to the true lines, levels and positions as per drawing, and in case any error is noticed at any stage in the Contractor's work, it shall be corrected / rectified by him without any cost to the Owner.

2.4 Site Clearance and Demolition

The site shall be cleared of all trees, stumps, roots, brushwood, bushes and other objectionable materials. Useful and saleable material, if any shall be the property of the Owner and shall be stacked properly as directed by the Project Consultants. The areas to be covered with embankments shall be stripped of topsoil to required depths to expose acceptable founding strata. Topsoil unsuitable for use in embankment construction and other fills shall be disposed off as directed. All this combustible materials shall be stacked and burnt in locations sufficiently remote to eliminate all danger of fire hazards. All old concrete, brick works and drains which interfere with construction works shall be dismantled with the approval of the Project Consultants taking all necessary precautions prescribed in safety specification. Topsoil, which is suitable for use in construction work, shall be stockpiled for later use. Other objectionable materials such as trash, debris, stones, brick, broken concrete, scrap metal etc shall be disposed off as directed by the Project Consultants. Payment for cutting and removal of trees, stumps, dismantling existing structures and stripping shall be regulated by the description in the Schedule of Items or Part V of these specifications.

2.5 Classification of Soil

The Project Consultants will decide the class of any particular soil. Classification of soil shall be as under and the decision of the Project Consultants shall be binding on the Contractor:

A. ***Ordinary Soil :***

Soils which yield to ordinary application of pick and shovel, phawra rake or other ordinary digging implements (including earth moving equipment such as bulldozer, shovels with out resorting to blasting) without offering much resistance, shall be classified as ordinary soil. This includes organic soil, turf, sand shale and loose moorum etc.

B. ***Hard Soil***

This comprises of all soils that cannot reasonably be excavated by the above-mentioned digging implements, but can be excavated with close application of pickaxe or scarifies or jumpers to loosen This includes compact moorum, stiff clay, hard shale, cobblestone etc.,

C. ***Soft/Decomposed Rock***

This comprises of all rocks or boulders which may be quarried or split with crow bars pavements breakers etc, This includes lime stone, sand stone, weather rocks and hard conglomerates, etc., and existing structures embedded in earth and tarred macadam roads, pavements, met in the excavation.

The fact that Contractor resorts to blasting for his own reasons shall not mean that the rock is hard classified as hard rock.

D. *Hard Rock*

This comprises of rock, which require blasting for excavation. Where blasting is prohibited, excavation has to be carried out by chiselling, wedging or any other agreed methods.

2.6 Method of Excavation

The Contractor may carry out excavations, filling and compaction by any method considered most suitable, and befitting the site conditions subject to any stipulations contained in the contract and the specifications. All excavation shall be required to be kept completely free from water; from whatever source it may come, during the construction. No foundation work shall be taken up until the surfaces are properly drained.

2.7 Excavation of Soils Other than Hard Rock

Excavation shall be carried out in the most expeditious and efficient manner to the lines and levels as indicated in drawings or as directed by Project Consultants. Prior approval of the Project Consultants shall be taken for the method to be adopted for excavation including dimensions, side slopes, dewatering, shoring etc. Such approval shall not make the Project Consultants responsible for any consequent damage or loss caused. All precautions shall be taken to preserve the material below and beyond line of excavation in soundest condition. All damages done beyond limits of excavation shall be made good by the Contractor at his own cost in a manner approved by the Project Consultants. All excavated materials shall be removed to spoil heaps, dumping yards or transported or filling as may be necessary. When soil heaps are formed for future use, heaps shall be protected from washing away due to rain or surface run off. The sides of excavation shall be maintained in stable condition by adequate stepping and batter. To prevent entry of surface water and accumulation of subsoil water in excavated areas, suitable drainage arrangements as may be needed and directed by Project Consultants, shall be provided and maintained. Pumped out water shall be drained off properly avoiding damage to other existing works. if any pipelines, cables or service lines are likely to be exposed, excavation around these services shall be carried out manually and all such services shall be adequately supported and protected at no extra cost.

Excavation shall be carried out in any material encountered including road surfaces, pavements, buried parts of old foundations, pits or other structures. Excavated materials shall be placed beyond
1.5 metres of the edge of the excavation pit/trench or half the depth of the pit/trench whichever is more or further away as directed by the Project Consultants. Sumps made for dewatering must be kept clear of the foundations.

In firm soil the sides of the trenches shall be kept vertical up to a depth of 2.0m from the bottom and for a greater depth, trench shall be widened by allowing steps of 50 cms on either side after every 2.0 m depth from the bottom, so as to give a vertical side slope of $^1/_4$: 1.Where the soil is soft, loose or slushy, the width of the steps shall be suitably increased or sides suitably sloped or suitable shoring and strutting provided as directed by the Project Consultants. For trenches deeper than 2.0 m the Contractor shall obtain detailed Instruction from the Project Consultants in writing regarding the stepping, sloping of sides or shoring and strutting to be done. For these by-works, no extra cost will be paid to the Contractor.

2.8 Excavation in Hard Rock

Where hard rock is met and blasting is considered necessary for its excavation, the Contractor shall intimate the Project Consultants in writing. Excavation in hard rock shall be done either by blasting or chiselling or by such other agreed methods as may be required Levels of hard rock surface shall be taken and got approved by Project Consultants before

start of excavation. Blasting shall be permitted only when proper precautions are taken for protection of persons, works and property. The Contractor shall obtain the necessary licence for procuring, storing and using explosives.

Blasting operations shall be carried out by a licensed Blaster. The quality and quantity of explosives, size and spacing of holes depth of holes etc., shall be such that they will neither open seams nor damage or shatter the rock beyond the specified lines of excavation A tolerance of 150 mm will however be allowed beyond the excavation lines. As excavation approaches final stages, the depth of holes and the amount of explosives used shall be reduced progressively to avoid over breakage or damage to founding strata. Any fissures, cracks and voids below prescribed depth of excavation shall be corrected by lean concrete of M5 grade or (1 :5: 1 0) cement concrete in the case of foundations Where excavated surface is to receive structural concrete, the surface shall be leaned of dust and other objectionable materials.

In cases where blasting, though otherwise required, is prohibited because of any reason, the excavation shall be carried out by chiselling, wedging or such other agreed methods All materials excavated from blasting chiselling or any such methods shall be stacked for measurement as directed by Project Consultants.

2.9 Cutting and Filling for Site Leveling

Excavation and filling operations for site levelling shall be so planned and executed, that transportation and rehandling are minimised. The sides of excavation and fills shall be maintained in stable condition by adequate batters, stepping and dewatering. Materials not desirable shall be disposed off in area indicated by Project Consultants. When it is required to blend the material, it shall be by selective excavation and filling operation Wells, Ponds, Cesspools and waterlogged areas shall be emptied of water and deslushed before filling. Filling shall be done in horizontal layers not exceeding 300 mm in thickness as specified or as directed by the Project Consultants. All clods shall be broken before placing the fill. Earth moving equipment shall be allowed to ply over the fill to permit compaction. Adequate allowance shall be made for subsidence of fill material. Levels shall be taken and excess or shortfall shall be made good by appropriate cutting for filling.

2.10 Excavation of Trenches

Excavation for trenches shall be carried out in materials encountered to enable lying of service lines or drainage channels or any other desired purpose. Excavation shall be done to lines and levels shown in drawings and shall be dole providing adequate measures for stability. Vertical wooden sleepers or light rails shall be erected at uniform levels at places where changes of direction and gradients occur. Centre lines shall be marked on horizontal sleepers or rails, laid across the trenches. Depths of excavation and pipe invert levels shall be checked by means of boning rods of appropriate lengths. Trench beds shall be trimmed and rammed with sprinkling of sand or moorum to required gradients for continuously supporting the pipelines. Trenches shall be locally deepened and widened to receive sockets and permit joints to be inspected.

In case of trenches, tunnels, channels, drains, manholes, chambers, basements and other places where the soil is not capable of retained with out support, timbering as directed by the Project Consult3nts shall be resorted to. It shall be the responsibility of the Contractor to take all the necessary steps to prevent the sides from collapsing.

2.11 Excavation for Foundations

Excavation for foundations shall be done to the lines and levels indicated in the drawings. Excavated material shall be transported and stored at convenient spots for reuse in back filling oof foundations and other fills. Surplus material shall be transported, spread and levelled at dumping areas. Side slopes of excavation and / or shoring shall be adequate from consideration of stability and working space. When so required and authorised by Project Consultants, the sides of excavation shall be protected with proper shoring, strutting, sheeting and sand bags etc, these shall be removed only when work in the pit is completed,

with the approval of the Project Consultants. When it is felt that removal of supports may result in side collapse or settlement of adjoining ground or endanger adjoining structures and foundations, they shall be left permanently in position. The last 150mm of excavation shall be done and the bottom trimmed to the required levels only when concreting is imminent. If at any point the natural ground is disturbed or loosened for any reason, it shall be consolidated by tamping or rolling or made up with concrete of M5 grade or (1:5:10) cement concrete if so ordered by the Project Consultants at no extra cost. Where the soil. Encountered at depths indicated in drawings is loose or weak, it shall be further excavated to levels of firm strata as may be directed by the Project Consultants and filled with lean concrete of M5 grade or (1 :5: 1 0) cement concrete or sand as directed. If the bottom of excavation has left exposed not through neglect or fault of the Contractor and it has become deleteriously affected by atmospheric action and water, such portion of deteriorated foundation material shall be removed and made good by lean concrete of grade M5 grade or (1 :5: 1 0) cement concrete or sand as directed and such extras will be paid for.

For deep excavation in the proximity of existing buildings, foundations, streets, railway tracks, underground cabling, gas piping, water and drainage lines, and the like, adequate appropriate precautions shall betaken to protect such structures or works from damage, displacement or settlement either as an immediate result of the excavation or as after effect, discernible with the passage of time. The method of protection of existing structures and services may include sheet piling, shoring, strutting slinging or any other method including dewatering. Payment for such protective work shall be governed by the description given in the Schedule of Items for the particular work.

For excavation adjoining existing piles care shall be taken to ensure that no pile under any circumstances is exposed from the top fro a height exceeding 2 meters. No strutting shall be done against exposed piles nor exposed piles ever used for tying ropes or supports either temporarily or permanently.

2.12 Excess Excavation

All excavation done beyond the specified limits or directions of Project Consultants shall be considered as excess excavation. They shall be made good as prescribed below by the Contractor at his cost:

i) Excess excavation in case of site levelling shall be made good by filling and compacting with material same as the surrounding material Degree of compaction shall be at least the same as the surrounding material.

ii) Excess excavation In case of trenches shall be made good by filling and compacting with selected earth to the same compaction as the surrounding material or as directed by Project Consultants This shall be done in layers not exceeding 150 mm thick, moistened and thoroughly compacted by tamping,

iii) Excess excavation in case of foundation beyond required depths shall be made good by filling with lean concrete of M5 grade (1: 510) cement concrete.

2.13 Disposal of Excavated materials

Excavated materials that are unsuitable for use in construction works or in excess of construction requirements shall be disposed off in dumping yards or in locations indicated by the Project Consultants. Waste piles / heaps shall be located in such places where they will not interfere with natural flow of rainwater access or transport or with the access to nearby structures. When required, they shall be levelled and trimmed to such lines and levels as indicated by the Project Consultants.

2.14 Back filling of Trenches

Trenches shall be backfilled after pipes or service lines are tested and approved Filling shall be done with earth in 150 mm thick layers free from unwanted materials and well rammed Soft material shall be used in bottom with other fill materials. All clods and lumps shall be broken before placement. Care shall be taken not to disturb, break or damage the pipes during backfilling and compaction process.

2.15 Back Filling of Foundations

Backfilling foundations shall be done using suitable soils from excavations. Soil shall be free from organic matter and other materials that would affect the stability of the fill and shall be free from boulders, brickbats wood pieces and other injurious materials, lumps and clods Before commencement of backfilling of foundations, all shoring and formwork, bits of timber, cement bags and all other rubbish shall be removed Hydro-installation, Bitumen painting or application of anti- corrosive protective and anti-termite treatments shall have been completed. Backfilling operation shall not commence without the approval of Project Consultants. Backfilling shall be carried out in well-compacted layers of 150 mm thickness. Each layer shall have near optimum moisture content. Layers will extend to the entire width of excavation and shall be sprinkled with water during compaction process. Ramming shall be done to achieve firm compaction. Backfilling shall be trimmed and finished to lines and levels indicated in the drawings and/or as directed by the Project Consultants. Mechanical equipment like vibrator roller, vibro earth rammer or vibratory compactor shall be used for compaction.

2.16 Filling Under Floors

Material for filling under floors shall be free from harmful minerals vegetable matter etc., and shall not be expansive soils. Filling shall be done in well-compacted layers not exceeding 150 mm in thickness. Each layer shall be compacted to 95 % Standard Proctor Density. Sufficient soaking shall be done before compaction. The entire area to be covered by flooring shall be finally dressed and trimmed to required levels. Mechanical equipment like vibrator roller, vibro earth rammer or vibratory compactor shall be used for compaction.

2.17 Load Bearing Fills

Load bearing fills include embankments for roads and railways and such other earth fills above ground levels provided for protection of fuel oil tanks, pads for storage tanks, drain, bunds and the like. Fill materials shall either be selected earth obtained from excavations for site levelling, trenches and foundations or from selected borrow areas as may be required. Soils having high silt and clay content and having laboratory maximum dry density less than 1.44 gms per c.c shall not be used for load bearing fills. For fills greater than 3 mm in height soils shall have laboratory density not less than
1.52 per c.c. Soils for top 500 mm of fills for roads and railways shall have laboratory density not less than 1.65 Gms per c.c. and shall not have marked swelling and shrinkage properties.

Foundations preparations for embankments shall be done as prescribed under site clearance. The founding strata shall be compacted as much as possible by rolling or tamping before placement of fill material. The water content of founding strata should be same as that specified for embankment fill. Any pockets of loose material or depressions left in founding strata as a result of clearance operation shall be filled and compacted with the same material as the surrounding founding strata. When an embankment is to be placed on steep sloping ground the surface of the ground shall be trenched in steps or trenched or broken up in such a manner that the new material bonds well with the founding strata.

Fill material shall not be placed until foundation has been inspected and approved by Project Consultants. Material shall be placed in even, continuous, horizontal layers over full width of embankment in well-compacted layers not exceeding 200 mm thickness. Each layer shall be

compacted by means of smooth rubber tyred rollers, sheep- foot rollers, tractors, tampers or other mechanical means as may be found suitable for the location. Before rolling, the water content shall be checked and corrected by sprinkling with water or adding dry material or aeration as may be required. This shall be followed by mixing and the layer left for soaking before compaction. The water content shall be with in plus or minus 2 % of Standard Proctor Optimum Density of compacted layers shall be determined by sand replacement method. Average compacted density shall be at least 95% of Standard Proctor Density. The number of tests to be conducted for determination of moisture content and density shall be as prescribed by the Project Consultants. Side slopes of the embankments shall be formed along with the main embankment. No side dumping shall be formed along with the main embankment. No side dumping shall be done for the formation of slopes. When required the width of each layer shall be constructed slightly in excess of required width and slopes trimmed to remove loose edge materials and completed to the lines shown in drawings or as directed by Project Consultants. Sub grades for road works shall be thoroughly wetted sufficiently in advance of placing of any base course and it shall be ensured that it is firm and moist for at least 50 mm below the surface. Should the sub grade for any reason is loose or have density less than required, it shall be re- compacted and refinished. Excessive loss of moisture in the sub grade shall be prevented by sprinkling and / or scaling. No traffic or hauling equipment shall be permitted to ply on finished sub grade and any damage caused to such portion shall be made good by the Contractor at his own cost.

3. ANTI TERMITE TREATMENT

3.1 Scope

The scope of work includes setting up a chemical barrier against attack by subterranean termites while the building is under construction

3.2 Execution

3.2 a. General

Unless otherwise specified all work shall in general be executed as specified in I S: 6313 Part- II - 1981 and as per approved specification of the agency having special know- how for the job.

All necessary work to ensure uniform distribution and proper penetration of treating solution shall be done according to the instruction of the Project Consultants.

Soil treatment shall not be done when it is raining or when soil is wet with rain or subsoil water. ·Once formed, the treated soil barrier shall not be disturbed.

3.2 b. Chemicals and rate of application

Chemical like chlropyriphos 20 % EC (Confirming to I S 8963- 1978) in 1 % emulsion shall be applied by pressure pumps, uniformly over the area treat.
(1 part chemicals + 20 parts water = 1 % emulsion).

3.2 c. Treatment of pits, trenches & basement excavations

Foundations, basements etc may either be fully enveloped by the chemical barrier or the treatment may start 500 mm below ground level. The bottom surface and sides of excavation (unto a height of about 300 mm) for column pits, walls, trenches and basements shall be treated with emulsion @ 5 litres per Sq.m of surface area. Back fills around columns, walls, etc. shall be treated @7.5 litres per Sq.m of the vertical surface. Treatment shall be done in stages following the compaction of Earth in layers. The treatment shall be carried out after the ramming operation is done by rod ding the earth at 150 mm centres closed to the wall surface and spraying the emulsion in the specified dose.

3.2 d. Treatment of Top Surface

Holes 50mm to 75mm deep at 150 mm centres both ways shall be made with crowbars on the surface of the compacted plinth fill. Emulsion @
5 litres per Sq.m of surface area shall be applied prior to laying soling or sub grade. Special care shall be taken to maintain continuity of the chemical barrier at the junction of vertical and horizontal surfaces.

3.2 e. Treatment of doors, windows & soil surrounding pipes, wastes and conduits

Special care shall be taken at the points where pipes and conduits enter the building and the soil shall be treated for a distance of 150 mm and a depth of 75 mm at the point where they enter the building.

3.2 f. Treatment of expansion joints

These shall receive special attention and shall be treated in a manner approved by the Project Consultants.

3.2 g. Acceptance criteria

The Contractor shall give a 10-year service guarantee in writing supplemented by a separate and unilateral guarantee from the specialized agency for the job to keep the building free of termites for the specified period at no extra cost to the Owner.

4. CONCRETE (PLAIN & REINFORCED)

4.1 Scope

This chapter covers the workmanship, special requirements & regulations with which the contractor must comply to achieve the following two objectives :

4.1.a The provision, at all locations on the site, of dense workable concrete, having the specified characteristics strength.

4.1.b The placing of concrete at all elevations, well compacted by vibrations, in well aligned and well fixed formwork ensuring the internal and external dimensions of structures as per drawings and maintaining the size. shape, number and locations of reinforcements, inserts etc., as specified in the drawings providing the surface finish after stripping off the formwork to ensure the structural configurations as per drawings as well within the specified tolerance limits, curing and guaranteeing the characteristics strength, all as specified.

4.1.c. The mixing, placing, compacting, curing and finishing of concrete shall be done according to I S: 456- 2000 "Code of Practice for Plain and Reinforced Concrete".

4.2 Materials

For materials, reference to Part I (materials) shall be made.

4.3 Grades of concrete

The grades of concrete unless otherwise specified shall be in accordance with the following table. The grade of concrete to be used in each section of work will be shown in the drawings or in the Schedule of Items:

Grade of Concrete	*Characteristic Strength i.e., Compressive strength of 15 cm., Cubes at 28 days (N/mm2)*	*Nominal Maximum Aggregate Size (mm)*
M-5A	5	63
M-5B	5	40
M-7.5A	7.5	63

M-7.5B	7.5	40
M-10A	10	63
M-10B	10	40
M-10C	10	20
M-10D	10	12
M-15	15	20
M-20	20	20
M-25	25	20
M-30	30	20
M-40	40	20

Note : A, B, C, D mentioned along with grade of concrete correspond to the maximum size of coarse aggregate being 63mm, 40mm, 20mm & 12mm respectively.

Unless otherwise specified in the drawings or Schedule of Items the maximum nominal size of coarse aggregate for different grades of concrete shall be as under:

i.	For concreting in very narrow space or in very small thickness	12 mm
ii.	For all reinforced concrete work except massive foundations	20 mm
iii.	For all ordinary plain concrete & massive reinforced foundations	20mm

4.4 Mix Design

4.4.a. GENERAL

At the commencement of the contract the Contractor shall make preliminary tests to determine the Proportions by weight of cement, fine aggregates, coarse aggregates and water necessary to produce required grades of concrete. The mix proportions shall be selected to ensure that workability of the fresh concrete is suitable for the conditions of handling and placing and when concrete hardens, it shall have the required strength, durability and surface finish. The Contractor shall get approval of Project Consultants to such proportions before he starts concreting. However, such approval shall not relieve the Contractor of his responsibility to produce concrete having compressive strengths as lay down in the foregoing table.

No departure from the approved proportions will be permitted during the works unless and until the Project Consultants gives written authorisation for any change in Proportion. The Project Consultants shall have authority at any time check whether the mixing of concrete is being carried out according to the approved proportions.

4.4.b. For the all major and important RC works and for all special works, the design of mixes shall be made by the Contractor at his own cost for each grade of concrete as well as for various workability. The design of mixes shall be made according to I S 10262-1982 or any other approved standard methods.

4.4.c. The concrete made by designing the mix is termed hereinafter as " Design Mix Concrete"

4.4.d. The cement content for various grades of concrete shall be based design mix. However, irrespective of requirement of cement found out from design mix, cement content of concrete shall not be reduced below the quantities specified as under except fro the cases specifically approved by the Project Consultants.

MINIMUM CEMENT CONTENTS, MAXIMUM W/C RATIO AND MINIMUM GRADE OF CONCRETE FOR DIFFERENT EXPOSURE WITH NORMAL WEIGHT AGGREGATES OF 20 MM NOMINAL MAXIMUM SIZE.

1	*Minimum cement kg/m³*	*Maximum Free w/c*	*Minimum Grade of Concrete*	*Minimum cement kg/m³*	*Maximum Free W/c*	*Minimum Grade of Concrete*
Exposure)						
Mild	220	0.60	M10	320	0.55	M20
Moderate	280	0.60	M15	340	0.50	M25
Severe	300	0.50	M20	375	0.45	M30
Very Severe	300	0.45	M20	400	0.45	M35
Extreme	320	0.40	M25	400	0.40	M40

nt content prescribed in the table is irrespective of the grades of cement and it is inclusive of addition mentioned in. The additions such as fiy ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and w/c ratio if the suitably established and as long as the maximum amounts taken into account do not exceed the limit of pozzolana and slag specified in IS: 1489 (Part I) and IS 455 respectively.

4.5 Water Cement Ratio

Where a particular water/cement ratio is stipulated in the design or drawing along with the characteristics grade of concrete the design of mix shall be carried out by adjusting the other variable factors to obtain the characteristics strength of concrete with stipulated water/ cement ratio.

In the structures where the impermeability and shrinkage of concrete have an important bearing on the durability and serviceability of the structures, such as water retaining structures, basements, underground premises, tunnels, pump houses, exposed structures near sea side or deserts, prestressed structure, thin precast members etc., the water cement ratio shall be kept low and preferably not exceeding 0.45.

The water cement ratio as achieved in the Mix Design, or as specified in the drawings shall be adhered to strictly and shall not be varied with out the permission of the Project Consultants.

4.6 Workability

4.6.1 The workability of fresh concrete shall be such that the concrete is just suitable for the conditions of handling & placing so that after compaction it becomes completely consisting and homogeneously surrounds all the reinforcement and completely fills the formwork.

4.6.2 The workability of fresh concrete at the place of batching / mixing shall be measured by compacting factor test at the place of disposition by means of slump test. During the finalisation of Trail Mixes, the relationship between compacting factor and slump test shall be established for each grade of concrete as well as for various levels of workability. The workability tests shall be carried out in accordance with IS: 1199-1959.

4.6.3 Normally, in the condition of low water cement ratio as well as for medium / high workability, the workability shall be achieved by increasing the cement content, in consistent with added water.

4.6.4 In cases, where the cement content is to be limited to reduce the heat of hydration, and the water/ cement ratio is also to be kept low to reduce the permeability or due to other requirements the desired workability may be achieved with use of limited doses of elasticize or air entraining agent. In such cases the method of mixing and dosage of the elasticize/air- entraining agent shall be according to the manufacturer's specification and with the approval of the Project Consultants.

4.6.5 Workability of concrete with placing conditions

Workability of concrete

Placing Condition	Degree of Workability	Slump (mm)
Blinding Concrete : Shallow Section : Pavement using paves :	Very low	See note
Mass concrete, lightly reinforced section in slabs beams, walls, columns : Floor Hand Placed pavements Canal lining, Strip flooring	Low	25 - 75
Heavily reinforced Section in Slabs, wall, columns	Medium	50 – 100
Slip formwork : Pumped concrete	-	75 – 100
Trench fill In-situ piling	High	100 – 150
Termite Concrete	Very High	See note

Note: For most of the placing conditions, internal vibrators (needle vibrators) are suitable. The diameter of the needle shall determined based on the density and spacing of reinforcement bars and thickness sections. For termite concrete vibrators are not required to be used.

In the very low category of workability where strict control is necessary e.g., pavement quality concrete, measurement of workability by determination of compaction factor will be appropriate than slump (see IS 1199:1959) with a value 0.75 to 0.80.

In the very high category of workability, measurement of workability by determination of flow will be appropriate.

Not withstanding any thing mentioned above, the slump to be obtained for work in progress shall be as per direction of the Project Consultants. With the permission of the Project Consultants, for any grade of concrete, if the water has to be adopted in trial mix design for each grade of concrete. No extra payment will be made for this additional cement.

4.7 Durability

The durability of concrete, depending on the exposure condition, is to be taken into account while designing the mix. For given aggregates, the cement content should be sufficient to make sufficiently low water cement ratio and table 5 of IS : 456-2000 shall be taken as guidelines for durability considerations.

4.8 Trail Mixes

4.8.1 After approval of the Mix Design by the Project Consultants, the Contractor shall make in presence of the Project Consultants the Trial Mixes for each grade of concrete as well as for required workability.

4.8.2 Before starting the trial mixes, necessary preparatory works like sieve analysis of the aggregates, determination of densities of different ingredients and

moisture contents in the aggregates, shall be completed according to the IS Codes 3831970 and 2386-1963.

4.8.3 Each trial mix shall be handled and compacted by the method which the Contractor proposes to use for that mix in the works and the mixes shall not show tendency of inadequate compaction by the method proposed.

4.8.4 The compaction factor and the slump of the each trial mix shall be determined immediately after mixing and the values shall not exceed the maximum value obtained in the mix design.

4.8.5 Six numbers of 150 mm test cubes shall be made from each trial mix. These shall be cured and tested in accordance with relevant I S Codes. In order to have the specified characteristic strength in the field, the concrete mix as designed in the Design Mix shall have higher average compressive strength depending on the degree of quality control at site. If the size and special requirement of the work so warrants, the trial may be extended to cover larger ranges of mix proportions as well as other variables such as alternative source of aggregates, maximum size and grading of aggregates and different type and brands of cement.

4.8.6 Before commencement of the concreting works of particular grade of concrete, the Contractor must complete the work of trial mixes and subsequent testing of the test cubes obtained there from the design of the approved Mix for that particular grade of concrete

4.8.7 The entire cost of all the trial mixes including all the preparatory works for trial mixes. preparation of test cubes and their testing shall be borne by the Contractor.

4.9 Nominal Mix Concrete

4.9.1 Nominal Mix Concrete may be used for all concrete of Grade M10 and below. If design mix concrete cannot be used for any reason for Grade m-15 & M-20, nominal mix concrete may be used with the permission of Project Consultants. Nominal mix concrete shall not e used, in any case for Grade of concrete above
M-20.

4.9.2 The proportioning of materials for nominal mix concrete shall be in accordance with Table-9 of clause 9.3 of IS456-2000. The stipulations of Clauses 9.3.1.
I S 456-2000 shall also be taken into consideration.

4.10 Volumetric Mix Concrete

Where concrete is specified in Volumetric proportions such as 1 :4:8, 1 :3:6, 1 :2:4,
1: $1^1/_2$:3 1:1:2 etc., in the schedule of items, coarse and fine aggregates shall be measured by volume and cement by weight. The water cement ratio shall be within 0.45 to 0.70 depending upon the workabiiity.

4.11 Batching of Concrete

4.11.1 Cement

Cement shall always be batched by weight. A separate weighing device shall be provided for weighing cement. Where the weight of cement is determined by accepting the weight per bag, number of bags shall be weighed separately to determine the average net weight of cement per bag and the same shall be checked regularly.

4.11.2 Aggregates

4.11.3 For both Design Mix concrete and Nominal Mix concrete, the aggregates (coarse and fine) shall be batched by weight.

4.11.4 In particular cases, or where weigh- batching is not possible proportioning by volume batching may be allowed by the Project Consultants, provided Contractor guarantees the uniformity of aggregates throughout the period of construction. For this purpose, the Contractor shall submit to the Project Consultants sufficient data indicating the weight / volume relationship of aggregates for different types of concrete and after such approval, periodic checks on the weight/volume relationship of the aggregates shall be made by the Contractor to the satisfaction of the Project Consultants. Where the aggregates are moist and volume batching is adopted allowance shall be made for bulking in accordance with IS 2386 (Part-III)-1963.

4.11.5 Suitable adjustments shall be made for the variation in the weight of aggregates due to variation in their moisture contents.

4.12 ***Water***

Water may measure either by weight or by volume. When measured by volume, it shall be by well- calibrated conical shaped jar or vessel or from a calibrated tank fitted to the mixer.

4.12.1 It is very important to maintain the water cement ratio constant at its correct value. For the correct determination of amount of water to be add in the concrete mix, to maintain the water cement ratio constant, the amount of moisture content in both coarse and fine aggregates shall be taken into consideration, be as frequently as possible, the frequency for a given job being determined by the Project Consultants according to weather conditions.

4.12.2 Determination of moisture content in the aggregates

Determination of moisture content in the aggregates shall be according to IS 2386 (part-II 1)- 1963. Where tests are not conducted, the amount of surface water may be estimated from the following table:

Aggregates	*Surface water carried by Aggregates*	
Very wet sand Moderately	**7.5**	**120**
West sand	**5.0**	**80**
Moist sand	**2.5**	**40**
Moist gravel & stone chips +	**1.25 – 2.5**	**20 - 40**

+ Coarser the aggregate, less the water it will carry

4.12.3 Any solid admixture, to be added, shall be measured by weight, but liquid or semi- liquid admixture may be measured by weight or volume,

4.12.4

4.12.5 Water within plus or minus

The Accuracy of Batching shall be within the following

tolerance : Cement within plus or minus : 2%

by weight Aggregate within plus or minus : 5%

by weight Water within plus or minus : 0.50

by weight

4.13 Mixing and Transporting of Concrete

4.13.1 Mixing of

Concrete 4.13.1.1Machine

Mixing

Concrete shall always be mixed in mechanical mixer. Water shall not, normally, be charged into the drum of the mixer until all other ingredients are already in the drum and mixed for at least one minute. Mixing shall be continued until there is uniform distribution of materials and the mass is uniform in colour and consistency. The mixing time from the time of adding water shall be in accordance with IS: 1791-1985 but in no case less than 2 minutes or at least 40 revolutions.

4.13.2 *Transportation of Concrete*

4.13.2.1 Concrete shall be transported from the place of mixing to the place of placing concrete as rapidly as practicable by such means which will prevent the segregation or loss any of the ingredients and maintain the required workability. No water shall be mixed with the concrete after it has left the mixer.

4.13.2.2 Where concrete is transported over long distances, the Contractor shall provide suitable means by which different grades of concrete are readily identifiable at the place of final deposit.

4.13.3 *Actions before placement of concrete*

4.13.3.1 Programme of works

At the beginning of every fortnight, the Contractor shall give his detailed concreting programme for that fortnight to the Project Consultants. Such programmes, shall specify all information such as the locations where concrete is to be poured, type/grade of concrete, volume of concrete to be poured, number and Type of vibrators proposed to be used as proposed to keep as standby, number of skilled technicians and supervisors proposed to be engaged, the proposed time and period of pouring etc.

4.13.3.2 Checking & Approval

Before placement of concrete, the Contractor shall get all form works, reinforcements, inserts, conduits, openings, surface preparation etc., checked and approved by the Project Consultants. To facilitate such checking, the Contractor shall complete all his works according to the drawings and specifications well in advance before placement of concrete at least 36 hours for all major / important / complicated works and 24 hours for all minor/ ordinary/simple works. The checks are purely in the interest of the work and to draw the Contractor's attention to his contractual obligations to execute the works according to the drawings / specification and do not relieve the Contractors from his responsibility in getting the end results for the quality 7 strength of concrete and maintaining the shape, level & dimensions of the finished concrete, as well as the inserts, openings, other features within the tolerance limits.

4.14 Preparatory Works/Surface Preparation

4.14.1 For concrete directly on Earth foundation

4.14.1.1 Earth foundation on which direct placement of concrete is specified, shall be rammed and consolidated as directed by the Project Consultants such that it does not crumble and get mixed with concrete during or after placement If the foundation is quite wet, the same shall be kept dry and then sufficiently consolidated, if necessary, a thin top layer of the wet soil shall be removed and replaced by sand or other suitable materials as directed by the Project Consultants without any extra cost to the Owner. Care shall also be taken that earth from the sides also does not get mixed with the concrete, during or after placement, before it has sufficiently set and hardened.

4.14.1.2 The Earth foundation, over which concrete is to be placed direct, shall not be kept abandoned at the specified level and concrete shall be placed immediately following the final preparation of the formation otherwise suitable measures shall be taken, as directed by the Project Consultants without any extra cost to the Owner.

4.14.1.3 For Construction joints

All such joints shall have continuous square bond grooves to produce to produce a substantial and water -tight key. Where the placement of concrete has to be resumed on a surface, which has hardened, it shall be roughened, cleaned by wire or bristle brushing, compressed air, water jet etc and thoroughly wetted. For vertical construction joints neat cement slurry shall be applied on the surface immediate before the placement of concrete. For horizontal joints the surface shall be covered with a layer of freshly mixed mortar about 10 to 15 mm thick composed of cement and sand in the same proportion as the cement and sand in the concrete mix and applied immediately

before placing of the concrete. On this surface (i.e., on the surface of joints) a layer of concrete not exceeding 150mm in thickness shall first be placed and shall be well rammed against old work, particular attention being paid to corners and close spots. To ensure water tightness, care shall be taken to pun concrete properly against the old surface

4.14.2

a. On vertical surfaces of masonry

When the concrete is placed on the vertical surface of masonry (as in the case of thin concrete fins projected from the masonry surface), a groove of dimension as directed by the Project Consultants shall be cut in the masonry to ensure a proper bond and the surface shall be cleaned thoroughly, Before the placement of concrete, the surface shall be kept moist by spraying water at least for period of 2 hours and a thick coat of cement slurry shall be applied immediately before placement of concrete.

b. Over walls

Buildings paper over average 12 mm thick cement sand bearing plaster of 1:4 mix with neat cement finish shall be provided at the bearing of slabs over walls as directed by the Project Consultants

4.14.3 Inside the formwork (cleaning, surface preparation etc.)

The interior of the formworks, where the concrete is to be placed, shall be thoroughly washed by high pressure water jet or air jet to completely clean the entire volume from all sort of dirts, grease/oil, foreign and deleterious materials etc., The reinforcement shall be completely clean and free from all sorts of dirts, grease/oil, foreign and deleterious materials etc., Before placement of concrete, the form works coming in contact with concrete, shall be coated with form oil or aw linseed oil material or provided with any approved material to prevent adhesion of concrete to the form work, but utmost care shall be taken so that such oily material do not come in contact with the reinforcement.

4.15 Placing and Compaction of Concrete

4.15.1 The Concrete shall be placed and compacted before setting commences & should not be subsequently disturbed. No water shall be mixed with the concrete after it has left the mixer. Method of placing should be such as to preclude segregation. Approved mechanical vibrator shall be used for compacting concrete, and concrete shall not be over vibrated or under vibrated. No concrete shall be placed until the place of deposit has been thoroughly inspected and approved by the Project Consultants. All inserts and embedment properly secured in position and checked and forms properly oiled. No concrete shall be placed in the absence of the Project Consultants.

4.15.2 Concrete shall be placed on clean bed having the designed level. The bed shall be cleaned of all debris and other objectionable materials. Seepage water, if any, shall be controlled or diverted.

4.15.3 Concreting shall not be carried on during rains unless the Contractor has taken all precautions and the Project Consultants has given necessary permission Suitable measures shall be taken to control the temperature of concrete.

4.15.4 Where plums are permitted in massive concrete, they shall be washed and carefully placed. No stone shall be closer than 30cm to an expose face, nor nearer than 15cm to an adjacent stone.

4.15.5 Concrete shall not be dropped from a height of more than 2m except through a chute, the design and type of which shall be subject to the approval of the Project Consultants

4.15.6 The concrete shall be placed, spread and compacted by approved mechanical vibrator. Vibrators shall not be used for pushing concrete to adjoining areas.

4.15.7 For members involving vertical placing of concrete (eg. Columns, walls etc.), each lift shall be deposited in horizontal layer extending the full width between shuttering and of such depth that each layer can be easily and effectively vibrated and incorporated with the layer before by means of compaction.

4.15.8 For member involving horizontal placing of concrete (eg. Slabs, Beams etc.), the concrete shall be placed along the line of starting point in such quantities as will allow members to be cast to their full depth along the full width between side shuttering and then gradually brought towards the finishing point along its entire front parallel to the starting line. Vibration and surface finish shall follow behind the placement as closely as possible.

4.15.9 Utmost care shall be taken to avoid the displacement of reinforcements / embedded parts or movement of formwork or damage to faces of the formwork or transmission of any harmful vibrations / shocks to the concrete which has not hardened sufficiently.

4.15.10 All members shall be concreted at such a rate that no cold joint is formed and fresh concrete is placed always against green concrete, which is still plastic and workable.

4.15.11 Should any unforeseen occurrence results in a stoppage of concreting for one hour or such other time as might allow the concrete, already placed, to begin to set before the next batches can be placed, the Contractor shall make at his own cost, suitable tongue, and groove construction joint, as approved by the Project Consultants. Any additional reinforcement required as directed by the Project Consultants shall also be provided by the Contractor at his own cost Before placement of new batches of concrete over that construction joint, the surface preparation according to this specification stipulated earlier, shall be done by the Contractor at his own cost.

4.15.12 The concrete shall be worked well up against whatever surface it adjoins and compacted to such a degree that it reaches its maximum density as a homogeneous mass, free from air and water holes and penetrates to all corners of moulds and shuttering and completely surrounds the reinforcement All measures shall be taken to make the shape, size, and location of the finished concrete including its embedment, holes, openings etc., well within the accepted tolerance limit.

4.16 Construction Joint & Cold Joints

4.16.1 Construction Joints

4.16.1.1 Normally, the construction joints including crank including joints shall be constructed as per locations and details indicated on the drawings.

4.16.1.2 Where the location of the joint is not specified in the drawings, it shall be in accordance with the following guidelines.

A. in Columns

i. In cases of Projection from basement slab 300 mm from the top of base slab or 75 mm from the top of the haunches whichever is higher.

ii. In framing of beam at different elevation, 75 mm below the lowest soffit of the beam and in case of projection from beams and slabs 75 mm from the top surface of the beam/slab or at the top surface of beam/slab whichever

facilities formwork.

iii. For columns under flat slabs, 75 mm below the lowest soffit of the slab.

B. In walls (horizontal construction joints)

i. Walls projecting from base slab, 300 mm from top of base slab,

ii. Walls supporting the suspended slab 75 mm from the lowest soffit of the slab.

Note :

In case of water retaining structures and structures under the influence of ground water, approved water bars of suitable size shall be provided to make the joint completely watertight

C. In beams :

Beams shall be cast, as a rule, with out a joint. But if provision of a joint is unavoidable, the joint for simply supported beam shall be vertical and at the middle of the span; in continuous beam, the same shall be at the point of minimum shear force

D. In suspended slabs

i. In slab of small span there shall be no construction joints.

ii. In slabs of large span and continuous slabs, construction joint, if allowed by the Project Consultants shall be vertical at the middle of span and at the right angles to the principal reinforcement.

E. In walls (vertical construction joint)

As a rule, walls shall be cast monolithically without any vertical construction joint, unless specified in the drawing. However, for a long wall, the Project Consultants may allow vertical construction joint and the same shall be at the place of minimum shear force. In water retaining structures and in structures under the influence of ground water approved water bars of suitable size shall be provided to make the joints completely watertight.

F. In slabs resting on ground

i. For Plain Concrete

Concreting shall be done in alternate panels not exceeding 10 sq.m in area. The largest panel dimension shall be 5m.

ii. For normally reinforced slab

The area of pour shall not exceed 40 sq mm and the maximum panel dimension shall not exceed 8m.9

iii. For the basement slabs which act as structural member. There shall be no construction joint.

G. In ribbed beams

The Beams shall be cast monolithically with the slab in one continuous operation.

4.16.1.2.1 In all construction joints the reinforcements shall pass through as per drawings and the same shall not be disturbed in any way

4.16.1.2.2 The vertical construction joints shall be provided by insertion of board keeping provision for passage of reinforcements/fixtures/ embedment All construction joints shall be made to form a tongue and groove joint

4.16.2 *Cold Joint*

An advancing face of a concrete pour, which could not be covered before expiry of initial setting time for unexpected reasons, is called Cold Joint The Contractor shall remain always vigilant to avoid cold joints. If however, a cold joint is formed due to unavoidable reasons, the following procedures shall be adopted for treating it:

a. If the concrete is so green that it can be removed manually and if vibrators can penetrate the surface without much effort, fresh concrete can be placed directly over the old surface and the fresh concrete shall be vibrated systematically and thoroughly.

b) In case the concrete has hardened a bit more than (a), but can still be easily removed by a light hand pick, the surface shall be raked thoroughly and the loose concrete removed completely without disturbing the rest of the concrete in depth. Then a rich mortar layer of 12 mm thickness, shall be placed on the cold joint and then the fresh concrete shall be placed on the mortar layer and vibrated thoroughly, penetrating deep into layer of concrete.

c) In case the concrete at the joint has become so stiff that it cannot be remoulded and mortar or slurry does not rise in spite of extensive vibration, a tongue and groove joint shall be made by removing some of the older concrete and the joint shall be left to harden at least for 12-24 hours. It will then treated as regular construction joint and the surface preparation of the same, before placement of concrete, shall be as described in the appropriate clauses of these specifications.

4.16.3 *Hot weather concreting*

When concreting ion very hot weather the Contractor shall take all precautions as stipulated in IS: 7861 (Part-I)-1975 and stagger the work to cooler parts of the day to ensure that the temperature of wet concrete used, specially in massive structure, does not exceed 38 degree C.

4.17 Finishes to Exposed Surfaces of Concrete

The Contractor is to include in his quoted rate for concrete, the provision of normal finishes in both formed & unformed surfaces as and where required by the Project Consultants without any extra cost to the Owner. Some common finishes are indicated below:

4.17.1 *Surface which do not require plastering*

Surface in contact with casings shall be brought to a fair and even surface by working the concrete smooth against casings with a steel trowel while it is being deposited and also by v'/orking over the surface with a trowel immediately after the removal of the casings or centrings, removing any irregularities and stopping air holes, etc use of mortar plaster is not permissible for correcting levels, removing unevenness etc. However, if, in the opinion of the Project Consultants, such plastering is unavoidable then the thickness of plaster shall in no case exceed 5 mm and the plastering shall be in cement and sand mortar (1 :3).

4.17.2 *Exposed surfaces which need plastering*

Surfaces of beams/ columns flushing with the block work or other structures where intended to plaster, shall be hacked adequately as soon as the shuttering is stripped off so that proper bond with the plaster can develop

4.17.3 *Surface for non-integral finish*

Where a non-integral finish such as floor finish is specified or required, the surface of the concrete shall be struck off at the specified levels and finished rough

4.17.4 *For monolithic finish*

Where no more finishing course is to be applied as in the case of basement floor, industrial flooring or the screed concrete flooring etc" the concrete shall be completed and struck off at the specified levels and sloped with a screed, board and then floated with a wooden float. Steel towelling is then started after the concrete has hardened enough to prevent the excess of fines and water to rise to the surface but not hard enough to prevent proper finishing, Trowel ling shall be such that the surface is flat, smooth and neatly finished,

4.18 Curing of Concrete

4.18.1 General

The purpose of curing is to prevent loss of moisture from the concrete itself so that the cement inside the concrete is sufficiently hydrated which of course is slow and prolonged process. As soon as the concrete has hardened sufficiently the curing shall be started to cure the concrete properly and sufficiently is also the sole responsibility of the Contractor

4.18.2 *Different methods of curing*

Anyone of the following methods may be used as approved by the Project Consultants.

a. Curing by direct method

b. Curing by covering the concrete with absorbent material and kept damp.

4.18.3 *Curing by Direct water*

This is done either by ponding or spraying water.

a. Ponding

   Ponding is widely used for curing slab and pavements. Earth bunds are formed over the same is replenished at interval to make up for the loss of evaporation. As this type of curing is one of the best methods, 10 days of curing after final setting is sufficient.

b. By spraying water

   Curing is dons by spraying water by suitable means at approved time intervals While spraying it shall be ensured that the complete area is covered in order to avoid cracking, cold water shall not be applied to massive members immediately after striking the formwork, while the concrete is still warm. Alternative wetting and over drying shall be avoided.

Curing by spraying water shall be continued at least for 18 days after final setting

4.18.4 *Curing of concrete with absorbent material kept damp*

The entire concrete surface is covered either with Hessian, burlap, sawdust, sand, canvas or similar material and kept wet continuously for at least 12 days after final setting.

4.19 Testing of Concrete

4.19.1 General

The Contractor carryout, entirely at his own cost, all sampling and testing in accordance with the relevant IS standards and as supplement herein. The Contractor shall get all tests done in approved Laboratory and submit to the Project Consultants

the test result in triplicate within 3 days after completion of the test

4.19.2 *Consistency test (tests of fresh concrete)*

4.19.2.1 At the place of depositing / pouring of the concrete, to control the consistency slump tests and/or compacting factor tests shall be carried out by the Contractor in accordance with IS : 1199-1959 as directed by the Project Consultants

4.19.2.2 The results of the slump tests/compacting factor tests shall be recorded in a register for reference duly signed by both the Contractor and the Project Consultants. That register shall be considered as the property of the Owner and shall be kept by the Contractor at site in safe custody.

4.19.2.3 The results of the slump tests/compacting factor tests shall tally, within accepted variation of plus or minus 12% with the results in the respective design mix, incase of mix design concrete. For any particular batch of concrete, if the results do not conform to the requirements as specified in 4.20.2.3 or do not conform to any requirement of this requirement of this specification, the Project Consultants has the right to reject that batch and the Contractor shall remove the same immediately from the site, at no cost to the Owner.

4.19.3 *Strength test of Concrete*

4.19.3.1 While placing concrete, the Contractor shall make 6 nos. of 15 cms test cubes from particular batches of concrete as desired by the Project Consultants The frequency of taking test cubes shall be either according to clause 15.22 of IS 456-2000 or as directed by the Project Consultants.

4.19.3.2 The cubes shall be prepared, cured and tested according to IS: 516-1959. Out of 6 nos. of test cubes, 3 shall be tested for compressive strength at 7 days after casting and the remaining 3 at 28 days after casting

4.19.3.3 A register shall be maintained at site the Contractor with the following details entered and signed by both the Contractor and the Project Consultants. That register shall be considered as the property of the Owner

i. Reference to the specific structural member
ii. Mark on Cubes
iii. The grade of concrete
iv. The mix Concrete
v. Date and time of Casting
vi. Crushing strength at 7 days
vii. Crushing strength at 28 days
viii. Any other information directed by the Project Consultants.

4.19.4 *Acceptance criteria for test cubes*

The acceptance criteria of concrete on strength requirement shall be in accordance with the stipulations under clause 16 of IS: 456-2000

4.19.5 *Non- destructive tests on hardened concrete*

4.19.5.1 If there is doubt about the strength or quality of a particular work or the test results do not comply with the comply with the acceptance criteria as stipulated under clause 17 of IS: 456-2000, non-destructive tests on

hardened concrete like core test and / or load tests or other type of non destructive tests like ultrasonic impulse test etc. shall be carried out, as may be directed by the Project Consultants, by the Contractor at entirely his own cost.

4.19.5.2 The core tests and load tests shall comply with the requirements of clause 17.4 and 17.6 IS: 456-2000 respectively. In case of other types of special tests like ultrasonic impulse test etc., the stipulation of clause 17.8 of IS: 456-2000 shall be applicable.

4.19.6 *Concrete below specified strength*

In case of failure of test cubes to meet the specified requirements the Project Consultants may take one of the following actions :-

1. Instruct the Contractor to carryout additional test and / or works to ensure the soundness of the structure at Contractor's expense

2. Reject the work and instruct that section of the works to which the failed cubes relate shall be cut-out and replace at Contractor's expense and the resultant structures affected due to such rejections shall be made good at Contractor's expense,

3. Modification / remedial measures if approved by the Project Consultants to be carried out at Contractor's expense.

4. Accept the work with reduction In the rate In appropriate item, provided it is technically acceptable, The reduction in the rate shall be as given below :-

i. When test strength of the sample is above 90 5 of the characteristics strength, payment shall be made 10 % less than the contract rate

ii. When test strength of the sample is between 80-90% of the characteristic strength payment shall be made 255 below than the contract rate

4.19.7 *Concrete failed in non-destruction Test*

In case the test results of the core tests or load tests in a particular work do not comply with the requirements of respective clause (17.4 for core test and 17,6 for load tests) of IS 4562000 the whole or part of the work concerned shall be dismantled and replaced by the Contractor as may be directed by the Project Consultants, No payment for the dismantled concrete including relevant formwork, reinforcement, embedded fixtures etc shall be made, In the course of dismantling if any damage occurs to the adjacent structure or embedded item, the same shall be made good, free of charge by the Contractor, to the satisfaction of the Project Consultants

4.20 Steel Reinforcement

4.20.1 Material

Material shall be as specified in the respective Schedule of items, The specifications of materials shall be as per Part-I

4.20.2 Storage

Steel reinforcement shall be stored in such a manner that they are not in direct contact with ground, Bars of different classifications and sizes shall be stored separately Incases of long storage or in coastal areas, reinforcement shall be stacked above ground level by at least 15 cm, and a coat of cement wash shall be given to prevent scaling and rusting at no extra cost to the owner,

4.20.3 Bending and Placing

Bending and Placing of bars shall be in conformity with IS: 2502-1963 "Code of Practice for Bending and Fixing of Bars for Concrete Reinforcement" and IS: 456-2000" Code of Practice for Plain and Reinforced Concrete".

4.20.4 Welding of Reinforcement

Welding of mild steel reinforcement bars confirming to IS: 432(Part-I)-1982 shall be done in accordance with IS: 2751-1979 "Code Practice for Welding of Mild Steel Bars used for Reinforced Concrete Construction" with additional precaution that for lap welded Joints the throat thickness of weld beads shall be at least 3 mm or 0.6 times the nominal size of weld (which is the radius of bar) whichever is more.

Welding of cold worked high strength deformed bars confirming to IS: 1786-1985 shall be done using electric arc welding process using low hydrogen electrodes (Ferro Weld -lor Ferro Weld - II or equivalent) Oxy-acetylene welding shall not be used

Butt welding of bars up to 32 mm diameter for vertical splices shall be done either by single bevel groove weld or double bevel groove weld, with bevel angle 45 degree. Butt-welding of bars up to 32 mm diameter for horizontal splices shall be done either by single Veer-groove weld or double Groove-groove weld with chamfered angle of 45 degree to 60 degree. The diameter of welded joint shall be 1.2 times the diameter bar. Edge preparation for buttwelding shall be done by shearing machining and grinding. Oxy-acetylene flame shall not be used for cutting. Chamfered faces shall be smooth finished by hand file if required.

Lap welding of bars up to 20 mm diameter shall have a minimum bead length of 12 times the diameter of bar or 200 mm whichever is more arranged on one or both sides. The throat thickness of weld beads shall be 5 or 0.75 times the nominal size of weld (which is the radius of bar) whichever is more .In case of unsymmetrical lap weld with weld bead on one side only, the maximum length of each weld bead shall be 6 times the diameter of bar or 100 mm (whichever is more), separated by an equal length in between weld beads. Splice bars used in symmetrical weld joint shall have same diameter as the parent bars. Lap joint with single splice bars shall have weld beads on both sides

Lap welding of bars above 20 mm diameter shall be done using splice plate or splice angle. Thickness of splice plate shall not be less than 0.65 times the diameter of bar and width shall not be less than twice the diameter of bar and width shall not be less than twice the diameter of bar. The size of splice angle shall be such that its area of cross section is at least 1.62 times the area of bar being spliced. More than one third of the bars shall not be welded at nay one section and welded joints shall be staggered at a distance of 50 times the diameter of bars. Welding shall not be done at bends or curved parts of bars and it shall be located at least at a distance of 50 times the diameter of bar from bends

Tests :

Test pieces of welded bars shall be selected and rested in accordance with the provisions of IS: 2751-1979. The number of tests will be as laid down in IS: 2751-1979 or such larger number as the Project Consultants may decide having regard to the circumstances.

4.20.5 Cleaning

All steel for reinforcement shall be free from loose scales, rust coatings, oil, grease, paint or other harmful matters immediately before placing the concrete. To ensure this,

reinforcements with rust coatings shall be cleaned thoroughly before bending / placement of the same.

4.20.6 Placing in position

All reinforcements shall be accurately fixed and maintained in positions as shown on the drawings and by adequate means like mild steel chairs and / or concrete spacer blocks as required. Bars intended to be in contact at crossing points, shall be securely tied together at all such points by 20 G annealed soft steel wire or by tack welding in case of bars larger than 25 mm dia, as may be directed by the Project Consultants Binders shall tightly embrace the bars with which they are intended to be in contact and shall be securely held The vertical distance between successive layers of bars shall be maintained by provision of mild steel spacer bars They should be spaced such that the main bars do not sag perceptibly between adjacent spacers.

4.20.7 Clear Cover

Clear Cover shall be as specified in the drawings. If nothing IS specified In the drawing the clear cover shall be In accordance with the relevant clause of IS: 456-2000

4.20.8 light Structural work and embedded metaliic parts, conduits

4.20.8.1 Fabrication of metallic parts & light Structural works

Fabrication of all structural steel work shall be done in accordance with IS: 800-1984 "Code of Practice for use of Structural Steel in General Building Construction" Workmanship shall match to the best practice in modem structural shops. Greatest accuracy shall be observed in the manufacture of every part and all identical parts shall be strictly interchangeable Steel work shall be shop fitted and shop assembled as far as practicable to minimize site work and to meet transport restrictions All materials shall be straight and if necessary before being worked shall be straightened or flattened by pressure and shall be free from twists Shearing or flame cutting may be used and the resulting edges shall be clean and straight Flame cut edges shall be planed /cleaned by chipping or grinding. Sheared members shall be free from distortion at sheared edges. Welding and welded work shall conform to IS'. 816-1969 "Codes of Practice for use of Metal arc welding for General Construction in Mild Steel". Mild steel electrodes conforming to IS: 814-1991 "Specification for covered electrodes for metal arc welding of Mild steel" shall be used.

4.20.8.2 Transportation and Storages

All pieces shall be properly identified and bundled for transportation to work site. Care shall be exercised in the delivery, handling and storage of material is not damaged in any manner Materials shall be kept free of dirt, grease and foreign matter and shall be stored properly on skids or any other suitable supports to avoid contact with ground, damage due twisting, bending, etc.,

4.20.8.3 Erection of light structural work

Erection of light structural work shall be carried out in accordance with the provisions of IS: 800-1984. No component, which is, bend or twisted, shall be put in place until the defects are corrected. Components seriously damaged during handling shall be replaced. No riveting, permanent bolting or welding shall be done until proper alignment has been completed. Whenever field welding is to be done it shall be in accordance with the requirements of shop fabrication, Shop paints shall be removed before field welding for a distance of at least 50 mm on either side of the joints.

4.20.8.4 Erection of embedded metallic parts, inserts, conduits

Bolts and inserts shall be securely fixed in position as shown in the drawings,

before commencement of concreting. Bolts shall be checked for accuracy in alignment on both the axes. Limits of tolerance in alignment and level shall be shown in the drawing or described elsewhere in these specifications.

Where bolts are housed in sleeves, special care be taken after concreting is over and has partly set to ensure that the bolts move within the sleeves. The annular space of the sleeve shall be plugged with suitable stoppers to prevent the ingress of water, grout, dust, rubbish or other foreign material into it, both during and after concreting. Opened conduits shall be plugged similarly inserts are required to be placed in concrete, special care shall be taken to keep the grooves of such profiles free from the ingress of concrete, slurry etc. By suitable packing material, if necessary.

All threads for bolts and inserts shall be greased at intervals and kept covered to prevent damage.

4.20.8.4.1 Necessary templates, jigs, fixtures, supports shall be sussed as may be specified or required or directed by the Project Consultants free of cost the Owner. Exposed surfaces of embedded materials shall be painted with one coat of anticorrosive paint or bituminous paint, as desired, without any extra cost to the Owner. If welding is to be done subsequently on the exposed surfaces of the embedded parts, the painting for a length of 50 mm beyond each side of the weld line shall be cleaned off.

4.21 Shuttering

4.21.1 General

All shuttering, formwork, supports and staging shall be designed by the Contractor and be subject to approval by the Project Consultants. The Contractor shall submit drawings and calculations to the Project Consultants for scrutiny when called up on to do so. The shuttering shall be designed fro a live load of 400 Kg/m2 in addition to the weight of the green concrete, or such other load as the Project Consultants may specify. The Contractor shall be responsible for the correctness and strength of the formwork including its supports and centering and approval by the Project Consultants will not relieve him of his responsibilities.

4.21.2 *Material*

The staging and supports may be of round or sawn timber or tubular or other shapes in steel. Round timber shall preferably extend over the full height in one piece. These shall be securely jointed or otherwise fastened and spaced at suitable intervals as the design may warrant and shall be suitably braced at regular intervals horizontally and diagonally. The formwork shall be of steel plate on steel frame, wooden boards with steel sheet lining, or plywood or seasoned timber board Where ornamental and curved surfaces are required the material shall be very good seasoned timber or plywood, which can be shaped correctly.

4.21.3 *Fixing*

The shuttering shall conform to the shapes, lines, levels and dimensions shown in the drawing. It shall be fixed in perfect alignment and securely braced so as to be able to withstand, without appreciable displacement, deflection or movement of any kind, the weight of all construction, movement of persons and plant. It shall be so constructed as to remain rigid during the placing and compacting of concrete without shifting or yielding and shall be sufficiently water tight to prevent loss of slurry from the concrete.

All props shall be supported on sale plates and wedges. At the time of removing props these wedges shall be gently eased and not knocked out. The formwork shall be so designed that the sides are independent of the soffits and the side forms can be removed easily without any damage or shock to the concrete.

4.21.4 *Wrought Shuttering*

Wrought Shuttering shall be such as to produce a first class fair face on the concrete free from board marks or any other disfigurements. This shall be used for exposed surfaces where specified or directed by the Project Consultants. It may be made of heavy Quality plywood or steel sheets having smooth, plain surface

The joints in shuttering shall be arranged in a regular pattern approved by the Project Consultants. Wrought shuttering shall be aligned within a tolerance of 3 mm.

4.21.5 *Rough shuttering*

Rough shuttering shall be used for all surface of concrete walls, footings, etc., which are not exposed in the finished work or which are to be receive plaster and as directed by the Project Consultants. It may be made 01 timber, ordinary plywood or steel sheets.

4.21.6 *Special Provisions*

4.21.6.1 Wherever concreting of narrow member is required to be carried out within shutters of considerable depth. temporary openings in the sides of the shutters shall, if so directed by the Project Consultants, be provided to facilitate cleaning, pouring and consolidation of concrete.

4.21.6.2 In liquid retaining structures and structures below ground water level through bolts for the purpose of securing and aligning the formwork shall not be used

4.21.6.3 Forms shall be given upward camber, if so desired by the Project Consultants, to ensure that long beams do not have any sag. The camber may be 1 in 250 or as the Project Consultants may direct.

4.21.6.4 The joints in formwork shall be sealed by adhesive tapes or by other means, to prevent any leakage of slurry or mortar if so directed by the Project Consultants.

4.21.7 *Preparation for concreting*

Before any concreting is commenced the shuttering shall be carefully examined for dimensional accuracy and safety of construction. The space to be occupied by concrete shall be thoroughly cleaned out to remove rubbish, debris, and shavings and saw dust. The surface in contact with concrete shall be coated with an approved substance such as mould oil or other non-staining mineral oil to prevent adhesion. Where necessary the surface shall be wetted to prevent absorption of moisture from concrete. Care shall be taken to avoid the reinforcements corning in contact with shutter oil.

4.21.8 *Removing :*

4.21.8.1 Removal of forms shall never be started until the concrete has thoroughly set and aged, to attain sufficient strength to carry twice its own weight plus the live load that is likely to come over it during construction.

4.21.8.2 Removal of forms shall not entail chipping or disfiguring of the concrete surface Shuttering shall be removed without shock or vibration and shall be eased off carefully in order to allow the structure to take up its load gradually.

4.21.8.3 Under normal circumstances (generally where temperature are above 21 degree's), and here ordinary Portland cement is used shuttering may be

struck after the expiry of the following period :-

i.	Walls, Columns & vertical faces	24 to 48 hours as may be directed by the Project Consultants
ii.	Bottom of slab up to 4.5 m span	7 days
iii.	Bottom of slab above 4.5 m span Bottom of beam and arch, rise upto 6 m span	14 days
iv	Bottom of beam and arch, rise over 6 m span	21 days

These periods may be increased at the discretion of the Project Consultants. Special care shall be taken while striking the shuttering of cantilevered slabs and beams, portal frames etc.

4.21.8.4 Before removing the formwork, the Contractor must notify the Project Consultants to enable him to inspect the condition of the finished concrete immediately after the removal of the form works.

4.21.9 ***Contractor's responsibility***

Any damage resulting from faulty preparation, premature or careless removal of shuttering shall be made good by the Contractor at his own expense.

4.21.10 ***Irrecoverable shuttering***

In cases where the shuttering cannot be removed without damaging the structure itself or where removal of shuttering is rendered impossible due to the nature of construction or where the Project Consultants may so instruct, Such shuttering shall be classified as irrecoverable shuttering, However such abandoning of shuttering will be permitted only in situations when it will not remain exposed or otherwise cause damage of any kind.

4.21.11 ***Metal Forms***

Where permanently left-in-place metal forms or deck are shown in drawings or otherwise order to be provided by the Project Consultants, they shall satisfy the requirements with regard to load carrying capacity. The metal forms shall be obtained from a reputed manufacturer, whose performance guarantee shall be obtained and submitted to the Project Consultants. Designs and drawings giving full details shall be submitted to the Project Consultants in advance for approval

4.22 Damp Proof Course Concrete

4.22.1 Thickness

It shall be as specified in the drawings or in the items

4.22.2 *Mix*

The grade of mix shall be as specified in the drawing or schedule of quantities. If nothing is specified, the mix shall be I part of cement : ½ part of coarse sand : 3 parts of stone chips. The stone chips shall be 12 mm down graded. Approved water proofing admixture shall be mixed with cement as per manufacturer's specifications. The water cement ratio shall be as low as possible to increase the permeability of concrete and in no case more than 05.

4.22.3 *Preparation of base surface*

The base surface shall be well roughened by chipping and brushing with steel brush and shall be cleaned of all dirt, dust, grease, oil and all other foreign & deleterious materials Then the surface shall be well moistened with water.

4.22.4 *Placing and compaction*

Just prior to placement of D,P.C. concrete, a thick coat of cement slurry shall be applied on the vase surface. The placement shall be as specified for the concrete in beams. The concrete shall be well compacted to make it dense.

4.22.5 *Finishing*

When the concrete has set enough but remains still green, the top surface shall be marked in regular pattern by steel trowel so as to have proper bond wit future work.

4.22.6 Curing

The D.P course shall be kept continuously moist at least 10 days.

4.23 Concreting in Water Retaining

Structures General requirements

The basic specifications as regards 'mix' design, placing, compacting, curing etc. Shall conform to the requirements as specified herein before in this chapter. Over and above materials and workmanship shall conform to the stipulations of IS:3370 (part-I &11) - 1965 to make dense and impervious concrete. As specified herein before all the constructions joints shall be provided with approved water bars. The expansions and constructions joints, if any, shall be provided with the requirements specified in the drawing or as directed by the Project Consultants.

4.24 Application of Live Load

The designated live load shall be allowed on any structure only after 28 days, after proper curing is carried out on the last concrete poured in structure.

5. MASONRY

5.1 General

This specification deals with masonry and allied works in foundation, plinth and superstructure

5.2 Materials

For specification of materials Part-I shall be referred.

5.3 Selection of Mortars

Mortar for masonry shall conform generally to IS: 2250-1981 "Code of Practice for preparation and Use of Masonry Mortars", and proportion shall be as specified in the drawings or in the Schedule of Items".

5.4 Cement Mortar

5.4.1 Cement mortar shall be prepared by mixing cement and sand in specified proportion. It is convenient to take unit of measurement for cement as a bag of cement weighing 50 kg equipment to 0.035 cu.m Sand is measured in boxes of suitable size (say of 40 x 35x 25 cm). It shall be measured on the basis of dry volume. Incase of damp sand, the quantity shall be increased suitably to allow for bulk age in accordance with IS: 2386-1963 (part-III) or any approved method.

5.4.2 The mixing of mortar shall be done preferably in am mechanical mixer. This condition may be relaxed by the Project Consultants taking into account the nature, magnitude and location of the work. If mixed I the mixer, cement and sand in the specified proportion shall be fed in the mixer and mixed dry thoroughly, water shall be then added gradually and wet mixing continued for at least 3 minutes. In case of hand mixing also after mixing dry on a watertight masonry platform, water shall be added and the mortar turned over and over, backward and forward several times.

Fresh mixed mortar, incase becoming stiff due to evaporation of water may be retempered by adding water as frequently as needed to restore the requirement of the consistency but this shall be permitted only up to a maximum of 2 hours from the time of addition of cement in the mortar.

5.5 Brick Work

5.5.1 Storage and handling bricks

Bricks shall not be dumped at site. They shall be carefully handled and carefully stacked in regular tiers to avoid breakage and defacement of bricks and prevent and prevent contamination by mud or other materials. The supply of bricks shall be so arranged that as far as possible at least two days requirement of bricks is available at site at any time Bricks selected for different situations of work shall be stacked separately.

5.5.2 *Soaking & Cleaning Bricks*

Bricks required for masonry shall be cleaned to be free from dirt, dust and sand and fully soaked in clean water by submerging in vats before use, till air bubbling ceases. The bricks shall not be too wet at the time of use. After soaking they shall be removed from the tank sufficiently early so that at the time of laying they are skin dry and stacked on a clean space.

Setting out

The building lines shall be set out by the Contractor as per clause 7 of IS: 2212-1991 and got checked by the Project Consultants.

5.5.3 *Laying of Bricks*

5.5.3.1 Brickwork in general shall be as per IS 2212-1991. Bricks shall be laid in English bond. unless otherwise specified, with frogs upward over a full

bed of evenly laid mortar, and slightly pressed and tapped into final position to the lines levels and shape a~~ shown in the drawing fully embedded in mortar. All joints including insideb faces shall rx; flushed and packed. Not more than 8 courses shall generally be laid in a day. The first course itself shall be made horizontal by providing enough mortar in the bed joint to ill! up any undulations The horizontal of courses and the verticality of wall shall be checked very often with spirit level and plumb bob respectively.

5.5.3.2 Horizontal joints shall be truly horizontal and vertical joints shall line up in every alternate course. The joints shall not exceed 10 mm in thickness and shall be well finished and neatly struck The joints shall be kept uniform throughout the brick work All the brick joints of the face works shall be neatly raked out to a minimum depth of 15mm With the help of raking tools and the face of brick wall cleaned with wire brush to remove any splashes of mortar before the close of the day's work, While the mortar is still green and the last brick layer shall be cleaned with wire brush and the frogs free from mortar.

5.5.3.3 Walls coming in contact with R.C.C structures shall perfectly be bonded with M.S. Inserts or lugs where shown on drawings and the sides butting against the
R.C.C structures neatly and efficiently flashed and packed with rich mortar and cement slurry at no extra cost (cost of M.S. inserts or lugs used shall be measured and paid separately under relevant items). Where such lugs are not required to be provided, brick work shall be built tightly against columns, slabs, or other structural parts, around door and window frames with proper distance to permit caulked joint. Where drawings indicate structural steel columns or beam to be partly or wholly covered with brick work, bricks shall be built closely against all flanges and webs, with all spaces between steel and brickwork filled solid with mortar not less than 10 mm thick.

5.5.3.4 Damaged or broken brick or brick bats, shall not be used In brick work. Cut bricks may be used to complete bond or as closers or around irregular openings.

5.5.3.5 Bricks shall not be thrown from heights to the ground, but shall be handled carefully and put gently in position to avoid damaging their edges.

5.5.3.6 Selected bricks of regular shapes and dimension shall be used for face work.

5.5.3.7 Making of grooves, sleeves and chases shall be done, during the construction, to the lines, levels and position as shown in the drawing or as instructed by the Project Consultants. Such sleeves shall slope outward in external walls so that their surface cannot from channels for the easy passage of water inside.

5.5.3.8 Fixtures, plugs frames, pipes inserts etc., if any, shall be built in at the right places to the lines & levels as shown in the drawings while laying the course and not later by disturbing the brick work already laid.

5.5.3.9 Brick walls of one brick thick or less shall have one selected face in true plane and walls more than one brick thick shall have both the faces of wall in true plane.

All connected brick work shall be carried out simultaneously with uniform heights throughout the work, and in exceptional cases, with the approval of the Project Consultants, the brick work built in any part of the work may be lower than another adjoining wall/connected wall by a maximum of one metre and the difference in height of adjoining wall/connecting wall shall be raked back according to bond by stepping at an angle not steeper than 45 degree, without sacrificing the necessary bond, horizontally of layers, vertically of

joints and the wall. Toothing shall not be allowed in brick work, for raking back.

The top layer just below the R.C.C. Slab or beam shall be laid with frogs down over a layer of mortar on full width.

5.5.3.10 Openings in Brick work

Openings shall be made in brick work, which may be of any shape, size, at all levels, heights or depths, including round openings as shown in the drawing or as directed by the Project Consultants, maintaining the necessary bond using a minimum of cut bricks. Openings in external face walls, the sills, jambs, soffits of opening may be rebated and the sill shall be sloped slightly for drainage of rain water.

5.5.3.11 All exposed brickwork shall be rubbed down, thoroughly washed, cleaned and pointed as specified. Where face bricks of specific quality are used, the same shall be rubbed with carbon random stone.

5.5.4 *Half Brick masonry*

5.5.4.1 Half Bricks work shall be done in the same manner as for brickwork except that all courses shall be laid in stretches. Both faces shall be true to plane and the joints raked on both faces. Where reinforcement is considered necessary or specified and shown in drawing, MS bars or hoop iron shall be provided as stipulated in the Schedule of Items or as directed by the Project Consultants. The reinforcement shall be cleaned of rust and loose scale with a wire brush, and shall be laid straight on the mortar and lapped with the dowel bars provided in the column, securely anchoring them at their ends where the half- brick wall butts. The batching of mortar usually shall be in the proportion of 14 or as stipulated in the Schedule of Items Half of the joints shall first be laid and the other half laid after the reinforcement is laid in position, so that the reinforcement is fully embedded in position.

5.5.5 *Brick on edge masonry*

The work brick on edge masonry wall in superstructure shall be done ii the same manner as mentioned for brick work except that it shall always be reinforced with wire mesh netting of approved variety as specified in the item and embedded in cement mortar at interval as specified in the Schedule of Items The wire netting shall be continuously laid and securely anchored with the dowel bars provided & projecting from the walls/RCC structure or steel structures at their ends where brick on edge wall butts. The batching of mortar usually shall be in the proportion of 1:3 or as stipulated in the Schedule of Items.

5.5.6 *Protection of Brick work*

The Brick work shall be protected and covered with gunny bags or water proof sheets from the effects of inclement weather, rain, frost, etc. ,during the construction and until the mortar sets Care shall be taken during construction that the edges of jambs, sills and soffits of openings are not damaged.

5.5.7 *Curing :*

All brick works shall be kept moist for 10 days after laying

5.5.8 *Scaffolding*

5.5.8.1 Necessary and suitable scaffolding shall be provided at all heights to facilitate the construction of brick wall. Scaffolding shall be sound, strong and all supports and other members shall be sufficiently strong and rigid, stiffened with necessary bracings and shall be firmly connected to the walls securing then against swing or sway. Planks shall be laid over the scaffolding at required

levels. Scaffolding shall preferably be of tubular steel, although the Project Consultants may permit other material, depending upon the circumstances.

5.5.8.2 Scaffolding shall be double, having two sets of vertical supports, particular for the face and all exposed brickwork. Single scaffolding may be used for buildings up to two storeys high or at other locations, if permitted by the Project Consultants. In such case the inner ends of horizontal members shall rest in holes provided in header course only. Such holes shall not be allowed in pillars under one meter in width, or immediately near the skew backs or arches. The holes thus left in masonry shall be filled with bricks set in rich mortar and the surface made good on removal of scaffolding.

5.5.9 If for any reason the Contractor is required to erect scaffolding in property other than belonging to the Owner, including municipal Corporation or Local Bodies, necessary permission shall be obtained by the Contractor from the appropriate authorities and necessary licensing fees if any shall have to be borne by him.

5.5.10 All scaffoldings once erected shall be allowed to remain in position, efficiently maintained by the Contractor, till all the finishing works required to be done are completed and shall not be removed without the approval of the Project Consultants.

The Contractor shall allow workmen of other trades to make reasonable use of the scaffolding without any extra cost

5.6 Solid Block

5.6.1 Storage and handling Solid Concrete Blocks

Solid Concrete Blocks shall not be dumped at site. They shall be carefully handled and carefully stacked in regular tiers to avoid breakage and defacement of Solid Concrete Block and prevent and prevent contamination by mud or other materials. The supply of Solid Concrete Blocks shall be so arranged that as far as possible at least two days requirement of Solid Concrete Blocks is available at site at any time. Solid Concrete Blocks selected for different situations of work shall be stacked separately.

5.6.2 *Setting out*

The building lines shall be set out by the Contractor as per clause 7 of IS: 2212-1991 and got checked by the Project Consultants.

5.6.3 *Laying of Bricks*

5.6.3.1 Solid Concrete Black work in general shall be as per IS 2212-1991. Solid Concrete Blocks shall be laid in English bond, unless otherwise specified, over a full bed of evenly laid mortar, and slightly pressed and tapped into final position to the lines levels and shape as shown in the drawing fully embedded in mortar. All joints including Inside faces shall be flushed and packed. Not more than 5 courses shall generally be laid in a day. The first course itself shall be made horizontal by providing enough mortar in the bed joint to fill up any undulations. The horizontal of courses and the verticality of wall shall be checked very often with spirit level and plumb bob respectively.

5.6.3.2 Horizontal joints shall be truly horizontal and vertical joints shall line up in every alternate course. The joints shall not exceed 10 mm in thickness and shall be well finished and neatly struck. The joints shall be kept uniform throughout the Solid Concrete Block work. Both the Solid Concrete Block joints of the face works shall be neatly raked out to a minimum depth of 15mm with the help of raking tools and the face of Solid Concrete Block wall cleaned with wire brush to remove any splashes of mortar before the close of the day's work, While the mortar is still green and the last Solid Concrete Block layer shall be cleaned with wire brush and the frogs free from mortar.

5.6.3.3 Walls coming in contact with R.C.C structures shall perfectly be bonded with M.S. Inserts or lugs where shown on drawings and the sides butting against the R.C.C structures neatly and efficiently flashed and packed with rich mortar and cement slurry at no extra cost (cost of M.S. inserts or lugs used shall be measured and paid separately under relevant items). Where such lugs are not required to be provided, Solid Concrete Block work shall be built tightly against columns, slabs, or other structural parts, around door and window frames with proper distance to permit caulked joint. Where drawings indicate structural steel columns or beam to be partly or wholly covered with Solid Concrete Block work, Solid Concrete Blocks shall be built closely against all flanges and webs, with all spaces between steel and Solid Concrete Block work filled solid with mortar not less than 10 mm thick.

5.6.3.4 Damaged or broken Solid Concrete Block or Solid Concrete Block bats, shall not be used in Solid Concrete Block work. Cut bricks may be used to complete bond or as closers or around irregular openings.

5.6.3.5 Solid Concrete Blocks shall not be thrown from heights to the ground, but shall be handled carefully and put gently in position to avoid damaging their edges.

5.6.3.6 Selected Solid Concrete Blocks of regular shapes and dimension shall used for face work.

5.6.3.7 Making of grooves, sleeves and chases shall be done, during the construction to the lines, levels and position as shown in the drawing or as instructed by the Project Consultants. Such sleeves shall slope outward in external walls so that their surface cannot from channels for the easy passage of water inside.

5.6.3.8 Fixtures, plugs frames, pipes inserts etc., if any, shall be built in at the right places to the lines & levels as shown in the drawings while laying the course and not later by disturbing the Solid Concrete Block work already laid.

5.6.3.9 Solid Concrete Block walls of one Solid Concrete Block thick or less shall have one selected face in true plane and walls more than one Solid Concrete Block thick shall have both the faces of wall in true plane.

All connected Solid Concrete Block work shall be carded ou~ simultaneously with uniform heights throughout the work, and in exceptional cases, with the approval of the Project Consultants, the Solid Concrete Block work built in any part of the work may be lower than another adjoining wall/connected wall by a maximum of one metre and the difference in height of adjoining wall/connecting wall shall be raked back according to bond by stepping at an angle not steeper than 45 degree, without sacrificing the necessary bond, horizontally of layers, vertically of joints and the wall. Toothing shall not be allowed in Solid Concrete Block work, for raking back.

5.6.3.10 Openings in Brick work

Openings shall be made in Solid Concrete Block work, which may be of any shape, size, at all levels, heights or depths, including round openings as shown in the drawing or as directed by the Project Consultants, maintaining the necessary bond using a minimum of cut Solid Concrete Blocks. Openings in external face walls, the sills, jambs, soffits of opening may be rebated and the sill shall be sloped slightly for drainage of rain water.

5.6.3.11 All exposed brickwork shall be rubbed down, thoroughly washed, cleaned and pointed as specified. Where face bricks of specific quality are used, the same shall be rubbed with carbon random stone.

5.6.3.12 Half Solid Concrete Block masonry

5.6.3.13 Half Solid Concrete Blocks work shall be done in the same manner as for Solid Concrete Block work except that all courses shall be laid in stretches. Both faces shall be true to plane and the joints raked on both faces. Where reinforcement is considered necessary or specified and shown in drawing, MS bars or hoop iron shall be provided as stipulated in the Schedule of Items Or as directed by the Project Consultants. The reinforcement shall be cleaned of rust and loose scale with a wire brush, and shall be laid straight on the mortar and lapped with the dowel bars provided in the column, securely anchoring them at their ends where the half block wall butts. The batching of mortar usually shall be in the proportion of 1:4 or as stipulated in the Schedule of Items. Half of the joints shall first be laid and the other half laid after the reinforcement is laid in position, so that the reinforcement is fully embedded in position.

5.6.4 *Protection of Brick work*

The Solid Concrete Block work shall be protected and covered with gunny bags or water proof sheets from the effects of inclement weather, rain, frost, etc., during the construction and until the mortar sets. Care shall be taken during construction that the edges of jambs, sills and soffits of openings are not damaged.

5.6.5 *Curing*

All Solid Concrete Block works shall be kept moist for 10 days after laying.

5.6.6 *Scaffolding*

5.6.6.1 Necessary and suitable scaffolding shall be provided at all heights to facilitate the construction of Solid Concrete Block wall. Scaffolding shall be sound, strong and all supports and other members shall be sufficiently strong and rigid, stiffened with necessary bracings and shall be firmly connected to the walls securing then against swing or sway. Planks shall be laid over the scaffolding at required levels. Scaffolding shall preferably be of tubular steel, although the Project Consultants may permit other material, depending upon the circumstances.

5.6.6.2 Scaffolding shall be double, having two sets of vertical supports, particular for the face and all exposed brickwork. Single scaffolding may be used for buildings up to two storeys high or at other locations, if permitted by the Project Consultants. In such case the inner ends of horizontal members shall rest in holes provided in header course only. Such holes shall not be allowed in pillars under one meter in width, or immediately near the skew backs or arches. The holes thus left in masonry shall be filled with Solid Concrete Blocks set in rich mortar and the surface made good on removal of scaffolding.

5.6.7 If for any reason the Contractor is required to erect scaffolding in property other than belonging to the Owner, including municipal Corporation or Local Bodies, necessary permission shall be obtained by the Contractor from the appropriate authorities and necessary licensing fees if any shall have to be borne by him.

5.6.8 All scaffoldings once erected shall be allowed to remain in position, efficiently maintained by the Contractor, till all the finishing works required to be done are completed and shall not be removed without the approval of the Project Consultants. The Contractor shall allow workmen of other trades to make reasonable use of the scaffolding without any extra cost.

5.7 Stone Masonry

5.7.1 General

All aspects of the work shall be in conformity with the "Code of Practice for Construction of stone Masonry", IS:1597 (Part-I&II)-1992. Relevant clauses under brick work, such as setting out, making chases, openings, fixing frames and plugs, protection, curing, scaffolding, etc., shall apply to stone masonry and concrete bloc masonry.

5.7.2 *Mortar*

The mortar used shall be as specified in the schedule of Items or drawing.

5.7.3 *Holes and Plugs*

Holes in stone walls shall be left for water supply, plumbing, sanitation, electrification, etc., where shown on drawings or ordered by the Project Consultants as the work proceeds. The holes shall, on completion, be made good to match with the adjoining wall. The Contractor shall provide and fix wooden plugs, water supply piping, electric conduit pipes etc. Where so specified.

5.7.4 *Random rubble masonry*

5.7.4.1 All stones shall be wetted and cleaned of all dust and loose materials before laying. Stones shall be laid on their natural beds, fitted carefully to the adjacent stones to form neat and close joints fully packed with mortar and chips and spalls of stone may also be used wherever necessary to avoid thick mortar bed or joints. Walls shall be carried to plumb or to the specified batter. Stones may be brought to level course at plinth, window sills and roof levels and the leveling shall be done with concrete comprising of 1 part of the mortar as used for the masonry and 2 parts of 20 mm down graded hard stone ships at on extra cost. Bond shall be provided by fitting in closely the adjacent stones and by using bond stones running through the thickness of wall in a line from the face to back with at least one bond stone, or a set of bond stones, for every 0.5 sq.m of the wall surface. Face stones shall extend and bond well into the backing. These shall be arranged to break joints as much as possible, and to avoid long vertical lines of joints.

5.7.4.2 Quoins

Quoins shall be of selected stones, neatly dressed with hammer or chisel to form the required angle and laid header and stretcher alternately. No quoin stone shall be smaller than 0.025cum (25dcum in volume and it shall also not be less than 300mm in length, 25% of them being not less than 500 mm in length).

5.7.4.3 Joints

The stones shall be so laid that the joints are fully packed with mortar and chips and face joints shall not be more than 20 mm thick. When plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying, otherwise the joints shall be raked to a minimum depth of 20 mm by raking tool during the progress of work, when the mortar is still green.

5.7.4.4 Course rubble masonry-First sort

5.7.4.4.1 Laying

All stones shall be wetted before use. The walls shall be carried up truly

plumb or to specified batter. All courses shall be laid truly horizontal and all vertical joints shall truly vertical. The height of each course shall not less than 15 cm not more than 30 cm. Face stones shall be laid alternate headers and stretchers. No pinning shall be allowed on the face. No face stone shall be less in breadth than its height and at least one third of the stones shall tail into the work for length not less than twice their height.

The hearting or the interior filling of the wall shall consist of stones carefully laid on their proper beds in mortar, chips and spalls of stone being used where necessary to avoid thick beds of joints of mortar and at the same time ensuring that no hollow spaces are left anywhere in the masonry. The chips shall not be used below the hearting stone to bring these up to the level of face stones. The use of chips shall be restricted to the filling of interstices between the adjacent stones in hearting and these shall not exceed 10% of the quantity of stone masonry. The masonry in a structure shall be carried up regularly but where breaks are unavoidable the joints shall be raked back at an angle not steeper than 45 degree. Toothing shall not be allowed.

5.7.4.4.2 *Bond Stones*

Bond stone or a set of bond stones shall be inserted 1.5 to 1.8 meters apart, in every course

5.7.4.4.3 *Quoins*

The quoins, shall be of the same height as the course in which these occur. These shall be at least 45 cm long and shall be laid stretchers and headers alternately. These shall be laid square on the beds, which shall be rough-chisel dressed to a depth of at least
10 cm. In case of exposed work, these stones shall have a minimum of 2.5 cm wide chisel drafts at four edges, all the edges being in the same plane.

5.7.4.4.4 *Joints*

All be Joints shall be horizontal and all side joints vertical. All joints shall be fully packed with mortar; face joints shall not be more than one cm thick.

When plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying. Otherwise, the joints shall be raked to a minimum depth of 20 mm by raking tool during the progress of work, when the mortar is still green.

5.8 Course rubble masonry - Second sort

5.8.1 Laying :

Shall be as specified in 5.6.5.1 except that the use of chips shall not exceed 15% of the quantity of stone masonry, and stone in each course need not be of the same height but more than two stones shall not be used in the height of a course.

5.8.2 *Bond stones, Quoins*

Shall be as specified for first sort respectively.

5.8.3 *Joints*

All bed joints shall be horizontal and side vertical. All joints shall be fully packed wit mortar; face joints shall not be more than 2 cm thick.

When plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying. Otherwise, the joints shall be raked to a minimum depth of 20 mm by raking tool during the progress of work, when the mortar is still green.

6. PLASTERING AND POINTING

6.1 Materials

The specification of materials shall conform to the requirements as specified in Part - I.

6.2 Plastering

6.2.1 General

Plastering shall be done in accordance with provisions of IS:1661-1972. Mix proportions of mortar for plastering and thickness of plaster shall be as given either in the drawing or as per Schedule of Items or as directed by the Project Consultants. For special plaster work, necessary admixtures shall be added to mortar in required Proportion as per manufacturer's specifications or as specified herein. The thickness mentioned in the Schedule of items shall be minimum thickness.

6.2.2 Preparation Of Surface

The surface to be plastered shall be cleaned of all extraneous matter and rubbish. In masonry the joints shall be raked to a minimum depth of 12 mm and cleaned with wire brush. Concrete surfaces to be plastered shall be finished smooth with a wooded float in one plane and all internal angles shall be finished slightly rounded. If desired by the Project Consultants, any unevenness shall be rubbed down by carborundum stones. The surface to be plastered shall be wetted evenly before the application of plastering. Trimming of projections on brick/ concrete surfaces wherever necessary shall be done.

For one coat plastering the plaster shall be laid slightly thicker than the specified thickness and the surface then levelled with flat wooden float to the required thickness. For two coat plaster work, the first coat (usually half of total thickness) shall be applied as detailed above except that the surface shall be left rough and keys formed for the application of second coat. The second coat shall be laid on with a wooden float to the specified thickness and shall be applied a day or two after the first coat has set, but has not dried up.

Cement mortar for plastering work shall be used within 30 minutes after adding water to cement and should be kept agitated at intervals of 20 minutes.

If specified cement punning shall be done over the plastered surface by sprinkling neat cement powder evenly on the surface and rubbed smoothly with a trowel to give a fine coating. The plaster shall be kept wet for at least seven days and protected from extreme temperature and weather during this period.

The arises of doors and windows shall have richer mortar 1:3 in a width of 75 mm on either side or as required at respective location.

6.2.3 Concrete beams, slabs, columns, etc., framing into masonry are to be plastered along with masonry walls these edges wrapped with chicken wire mesh of gauge 24. Overlapping of mesh shall be minimum 75 mm on either side of the edge of the concrete element. Minimum lap for chicken wire mesh shall be 50 mm.

6.3 Cement Pointing

6.3.1 Where shown on drawing, Schedule of Items, or as directed by the Project Consultants, exposed brick faces shall be cement rule pointed. The mortar shall be raked out of the joints to a depth of 12 mm. The dust shall be brushed out of the joints and the wall well wetted. Unless otherwise specified the pointing shall be made with cement and sand mixed in proportion 1:3. The joints of the pointed work shall be neatly finished truly vertical and horizontal or as directed and the lines shall be kept wet till the cementing material has set and become hard. If required, the whole brick face shall be rubbed and polished with fine grade of

carborundum stones. Particular care shall be taken to see that no brick face or brick edge is damaged during this work.

6.3.2 Flush Pointing

The mortar shall be pressed into the joints and shall be finished flush and leveled. The edges shall be neatly trimmed with trowel and straight edges.

6.3.3 Ruled Pointing :

The joint shall be initially formed as for flush and then, while mortar is still green, a groove of required shape and size shall be formed by running a forming tool straight along the centre line of the joint till a smooth and hard surface is obtained. The vertical joints shall also be finished in similar way. The pointing line shall be uniform in width and truly horizontal in case of floors and ceilings.

Curing

The pointing shall be kept wet for 7 days. During this period it shall be suitably protected from all damages.

6.3.4 Pointing On Random Rubble Stone Masonry

In such pointing, the mortar shall be simply struck off trowel and the work left showing the natural irregularities in line and surface of the stones themselves. Other specifications shall remain same as per para 8.3 under sub head "Pointing".

6.4 Rough Cast Concrete Facing

6.4.1 The surface shall be prepared as for Cement plaster and then 2 cm backing coat of sand mortar 1:3 shall be applied. Subsequently, when the backing coat is in plastic state, a top coat 12 mm average thick cement and stone chips mixture in proportion 1:3 (stone chips 10 mm size and below) shall be applied by dashing the mixture on top with trowel to produce uniform rough texture. The mix shall again be dashed over the vacant spaces if any. The surface shall afterwards be cured for 10 days. After curing, the surface shall be brushed with hard wire brush to remove loose chips from the surface. A coat of cement wash shall then be applied, the cost of which shall be included in the rate of the item

6.4.2

6.4.3 RENDERED SAND FACED CEMENT PLASTER

The surface shall be prepared as for cement plaster. The backing coat shall be 12 mm thick of cement plaster proportion 1:4 (1 cement and 4 sand) and keys shall be formed on the surface. After curing this coat sufficiently, the finishing coat of 6 mm thick consisting of grey cement and screened coarse sand to required gradation (1:3) shall be applied and finished to the desired texture to the satisfaction of the Project Consultants. The surface afterwards shall be cured for 7 days.

6.4.4 PLASTER MOULDING

Where specified, plaster moulding shall be strictly as per drawings and details, and shall run clean and true from proper templates and moulds, to the entire satisfaction of the Project Consultants. Rates shall include for brick or concrete cores and for any necessary dabbing in cement mortar or brick or metal lath curing and final finish as desired. Where desired all angles in internal moulding work shall be covered to a radius of 50 mm or as directed without any extra charges.

6.4.5 FLOATING COAT WITH NEAT CEMENT

When the plaster has been brought to a true surface with the wooden straight edge, it shall be uniformly treated over its entire area with a paste of neat cement and rubbed smooth so that whole surface is covered with neat cement coating. Smooth finishing shall be completed with a trowel immediately and in no case later than half an hour of adding water to cement

6.4.6 PEBBLE DASH PLASTER

Specification shall be same as that for rough cast concrete facing vide 6.4.1 except that pebbles or graded crushed stone, of size 10 mm to 20 mm or as specified / directed by the Project Consultants, shall be well washed and drained and then dashed / thrown wet on the plaster surfaces while it is plastic, using strong whipping at right angles to the face of wall, pressed flat and filling uncover parts by hand so that finished surface represents homogeneous look The finished surface shall be lightly tapped with a trowel to ensure good bond

6.5 Punning with Lime or Plaster of Paris

6.5.1 LIME PUNNING

Lime punning shall be carried out with best quality approved lime. Lime shall be properly stirred, tempered with water to form a homogeneous mass and strained through fine cloth. The punning shall be laid and rubbed and troweled to an uniform smooth even finish using special trowels Any unevenness shall be rubbed down with fine sand paper. The plaster must be dry before the lime punning is applied. The punning shall be kept wet for a period of 7 days. The lime paste shall be kept wet until use and no more quantity than can be consumed in 10 days shall be prepared at a time No portion of the surface shall be left out initially to be patched up later on.

6.5.2 PLASTER OF PARIS PUNNING

This shall be provided by using the best quality of plaster of paris from approved manufacturer. Unless otherwise specified same procedure as for lime punning shall be followed for getting uniform smooth finish

7. FLOORING, PAVING & FACING

7.1 SCOPE

Flooring, paving and facing includes flooring, skirting and dado of various types encountered in plants, buildings, pavements etc, as described under respective heads. For the items which have not been covered up in this chapter completely or covered up only partly, specifications suggested by the manufacturers for the materials, surface preparation, workmanship and all other by-works etc, shall be strictly followed In addition to this entire job will have to be carried out as per direction of the Project Consultants, which shall be final.

7.2 MATERIALS

Materials shall conform to Part -I of this series

GENERAL

Flooring, skirting & dado may have to be done in discontinuous strips or areas to suit the needs of erection and commissioning of equipment. Flooring shall be done in close co-ordination with erection of equipment or other services and shall keep pace with the demands in respect of commissioning of individual equipment. No claims for extra shall be tenable for reasons of discontinuity of work delay in having areas available for work.

Unless otherwise specifically included in the Schedule of Quantities or stated in the description of work, no extra shall be payable for works such as forming covers at internal angles, nosing at plinths, steps, window sills and stair treads, dishing in bath rooms, toilet & other places and cutting to line and fair finish to top edge of skirting and dado. Thickness mentioned shall be the minimum.

7.3 SUB-BASE

Flooring at ground level having sub-base of sand or earth as specified shall be laid in layers of 15 cm, watered and consolidated by rolling with hand roller or ramming with iron rammed and with butt ends of the crow bars. When filling reaches the required level, the surface shall be flooded with water 24 hours, allowed to dry and then rammed and consolidated to avoid any settlement later. The thickness of the sub-base shall be as specified either in the drawing or in the Schedule of Items.

7.4 SUB-GRADE

The surface shall be brought to the desired level before sub-grade is laid, loose pockets shall be filled up and whole surface shall be consolidated by tamping, vegetable growth and other decomposed matter, rubbish etc., shall be removed.

HARD CORE SUBGRADE

Where hard-core sub grade is specified, stone / slag boulders / late rite boulders shall be laid closely stacked together, the longer edge being laid vertically. All interstices shall be filled with smaller particles of the same material or with gravel or red earth. The top surface shall be spread with loose mourn sufficient to cover the gap and to achieve uniform top surface. The surface shall then be adequately watered and rolled by roller. Hard core shall be laid to form the desired slope in the finished floor.

7.5 CEMENT CONCRETE FLOORING WITH INTEGRAL FINISH

Cement concrete shall be mixed, laid, consolidated and cured as described in Chapter "Concrete". Laying of concrete shall be done in alternate panels. The size and division of panels shall be as per direction of Project Consultants. The mix or grade of concrete shall be as specified in Schedule of Items.

The finished surface may be rendered smooth by trowel finishing to provide an appearance of fine and smooth textures surface and in panels or in geometric pattern as specified in Schedule of Items or as directed by Project Consultants.

7.6 CONCRETE FLOORING WITH GRANOLITHIC FINISH (ARTIFICIAL STONE FLOORING)

Granolithic finish shall either be laid monolithically over base concrete or separately over base concrete. The sub-grade shall be either brick khoa/lime concrete/cement concrete, as specified. Flooring shall be laid and finished according to IS:5491-1967.

7.6.1 *Thickness*

Unless otherwise mentioned the thickness of flooring including topping shall be either 25 mm or 40 mm or 50 mm as shown on drawing/ Schedule of Items. The net thickness of topping shall be 6 mm for 25 mm thick floor, 10 mm for 40 mm and 12 mm for 50 mm thick floor. An additional allowance of 2 mm in thickness of topping shall be made for cutting and grinding margin wherever polishing is specified in the item. The rate of the item will be inclusive of this.

7.6.2 *Mix*

For base or under bed course, the mix shall be 1:2:4 concrete, unless specified otherwise. The mix of the topping shall consist of 1 part cement: 1 part coarse sand: 1 part coarse aggregated by volume or 1 part cement and 1 part stone chips. The coarse aggregate shall be very hard like granite and well graded and size of chips shall be 3 mm for 6 mm topping to 3 mm for 10 mm or more thick topping. Minimum quantity of water to get workability shall be added.

7.6.3 Laying :

a. LAYING OF MONOLITHIC TOPPING

The topping base or under bed shall be laid as per specification "Cement Concrete" and levelled upto the required grade The surface shall remain sufficiently rough to take the finish.

To prevent construction cracks, the panels shall be divided in square or rectangular patter. For floor finish of 40 mm thickness or above, the maximum panel area shall be 2.5 sq.m with none of the sides exceeding
2.5 m, however for lesser thickness these shall be 1.5 sq.m and 2.5 m respectively. The dividing strip may be aluminium or glass or as specified and shall have the same depth as that of floor. Within about 2 to 3 hours of laying the base while it is still full 'green' the topping shall be laid evenly to proper thickness and grade. The topping shall be pressed firmly and rigorously to form full bond with the base / under bed.

The Latinate brought to the surface during compression shall be removed carefully without disturbing the stone chips. The surface shall then be lightly troweled to remove all marks and shall be left for sometime till moisture disappears from it. Fresh quantity of cement @ 2.2 Kg per sqm of the flooring shall be mixed to form thick slurry and spread over the surface while concrete is still green. The cement slurry then shall be floated even & smooth. Polishing, if specified, shall be done with polishing machine and the portion where machine cannot be used manually to the satisfaction of the Project Consultants, If specified so the surface of the flooring shall be finished ribbed, chequered or laid in slope without any extra cost unless specified so in the item. On completion, the floor shall be kept flooded with water for 10 days and shall be adequately protected before it is sufficiently hard.

b. LAYING OF TOPPING SEPARATELY ON HARDENED BASE

The sub base shall be laid as in clause 7.7.3 the surface of the base concrete shall be thoroughly brushed and cleaned free from all dirt, mortar dropping and Latinate etc. Where the surface has hardened too much, chipping or hacking of the surface may be necessary. The surface shall then be wetted with water for several hours and surplus water mopped. Neat cement slurry at 2.75 kg/sq.m of surface shall be brushed into the clean surface. The topping then shall be laid as described in clause 7.9.3.

7.6.4 GENERAL

The junction of the floors with all plaster dado or skirting shall be rounded off with 1: 1 cement mortar & polished, if specified or shown in drawing

7.6.5 CURING

Immediately after laying, the finish shall be protected against rapid drying. As soon as the surface had sufficiently, it shall be kept continuously moist for at least 10 days by means of wet gunny bags or ponding of water on the surface. The floor shall not be exposed to use during this period.

7.6.6 GRINDING & FINISHING

Where grinding is specified, it shall start only after the finish has fully set. The grinding shall be done with carborundum stone of No.60, then nO.80 and then 120 as per method as specified in in-situ mosaic flooring. After final polishing, the floor shall be rubbed with oxalic acid and then wax polished.

7.6.7 DADO & SKIRTING WORK (GREY CEMENT SKIRTING/DADO)

A backing coat of 12 mm thick and 15 mm thick shall be applied on walls after proper dabbing of the surface for a finished thickness of 18 mm and 21 mm thick respectively, with cement plaster of proportion 1:4 (1 cement and 4 approved quality sand) or as specified. Over this a top coat 6mm/7 mm thick consisting of one cement to one stone chips 3 mm nominal size shall be applied. If grinding and polishing specified, the same shall be done as per granolithic flooring with carborundum stones.

7.7 ACCEPTANCE CRITERIA

The Contractor shall satisfy the Project Consultants specially for the workmanship of the following finished floor :-

i. Level, slope, plumb as the case may be
ii. Alignment of joints, dividing strips etc.,
iii. Colour, texture
iv. Surface finish
v. Thickness of joints including the workmanship in joints
vi. Details at edges, junctions etc.,
vii. Performance
viii. Precautions specified for durability.

7.8 PRECAST MOSAIC TILE FLOORING

Applicable codes

IS:1443 Code of practice for laying and finishing of cement concrete flooring

Tiles IS:2114 Code of practice for laying in situ terrazzo floor finish.

IS:777 Glazed earthenware tiles

Providing & Fixing precast Mosaic tile flooring.

The type, quality, size, thickness, colour etc. of the tiles for flooring shall be as per the item description given in the Schedule of Quantities and of best quality. The contractor shall provide the Engineer with necessary sample for approval.

Before the tiling work is commenced, the sub-surface shall be thoroughly cleaned and washed of all loose material, dirt, and scum and then shall be wetted without forming water pools on the surface. The tiles shall be laid on cement mortar or lime mortar bedding of thickness and proportion as specified in the item description. The mortar shall be evenly spread on the sub-floor. Over this mortar bed, 4.4 kg of cement per sq.m of floor area shall be spread. The tiles shall be fixed on this bed one after another. Each tile being gently tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. The joints shall be perfectly straight and uniform in thickness. The tiles shall be laid perfectly in level unless otherwise specified by the Engineer. After laying the tiles the joints shall be finished with white cement or ordinary cement as specified.

For lime mortar-bedding lime from burnt stone shall be used. It shall be free from ash and impurities and be in the form of lumps and not powder when brought to site, lime which is damaged due to rain, soaking, moisture or air slaking shall be rejected.

Floor tiles laid adjoining the wall shall project 12mm or as specified under the plaster, skirting or dado as directed by the Engineer. Half tiles and pieces shall be avoided as far as possible. After laying the tiles, it shall be cured for atleast 14 days. About a week after laying the tiles each and every tile shall be lightly tapped with a small wooden mallet to find out if it gives a hollow sound, if it does, such tiles along with any other cracked or broken tiles shall be removed and replaced with a new tile to proper line and level. The same procedure shall be followed again after the tiles are finally polished. For the purpose of ensuring that such replaced tiles match with those earlier laid it is necessary that the Contractor order enough extra tiles from the factory to meet this contingency. The tiles shall finally be cleaned and polished by using dilute oxalic acid or any other method recommended by the manufacturer and approved by the Engineer.

After the joints have attained sufficient strength, the floors shall be machine polished to the desired finish approved by the Engineer. Sufficient quantity of water shall always be used during polishing to prevent scratches.

Mode of Measurement

Unit of measurement for floor tiling shall be sq.m or part thereof of the superficial area. Actual quantity of tiling work carried out shall be measured and paid for after making deductions for openings etc. The rate shall include the cost of tiles including wastage, laying as per specifications, curing, polishing etc. all complete.

7.9 PROVIDING & FIXING PRECAST MOSAIC TILES IN SKIRTING, DADO AND RISERS

For dado and skirting work, the vertical surface shall be thoroughly cleaned and wetted. Thereafter it shall be evenly and uniformly covered with about 12mm thick 1:3 cement mortar. For this work the tiles as obtained from the factory shall be of the size required and practically fully polished. The back of each tile to be fixed shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall with a wooden mallet. This shall be done from the bottom of the surface upwards. The joints shall be as close as possible and the work shall be truly vertical and flush. The tiles shall be fixed flush with the plaster or projected as specified by the Engineer. The junction of the plaster and the skirting or dado shall be neatly finished. The joints shall be filled with ordinary cement unless otherwise specified. After the tile has set, hand polishing with carborundum stones shall be done so that the surface attains a glossy finish. Corners and junctions be finished true.

Mode of Measurement

Skirting, dado or risers shall be measured in sq.m. or part thereof. The rate shall include providing tiles including wastage, laying as per specifications, filling joints, curing, rubbing and polishing etc. all complete.

7.10 CERAMIC TILE FLOORING

Providing and laying 'V' group Ceramic Tiles of any colour with size of
300 mm x 300 mm and 65 mm minimum thick for flooring in required positions, laid on a bed of 1:4 cement mortar including neat cement float, all special required like round edge tiles, corner cups etc filling joints with neat cement slurry mixed with pigment to match the colour of the tile in proportion mentioned by the manufacturer, curing and cleaning the tiles of cement and pigment spillage and splashes etc. complete as per the direction of the Engineer in Charge Tiles shall confirm to IS: 13753.

7.11 MORTAR BEDDING

The amount of water added while preparing mortar shall be the minimum necessary to give sufficient plasticity for laying. Care shall be taken in the preparation of the mortar to ensure that there are no hard lumps that would interfere with even bedding of the tiles. Before spreading the mortar bed, the base shall be cleaned of all dirt, scum or laitance and loose materials and then well wetted without forming any pools by the use of screed battens to proper level or slope. The thickness of the bedding shall be not be less than 15 mm with an average thickness of 20 mm. The tiles shall be laid on the bedding mortar when it is still plastic but has become sufficiently stiff to offer a fairly cushion for the tiles.

Fixing of tiles:

The tiles before laying shall be soaked in water for at least 2 hours. Tiles, which are fixed in the floor adjoining the wall, shall be so arranged that the surface of the round edge tiles shall correspond to the skirting or dadoing. Neat cement grout of honey like consistency shall be spread over the bedding mortar just to cover so much area as can be tiled within half an hour. The edges of the tiles shall be smeared with neat white cement slurry and fixed in this grout one after the other, each tile being well pressed and gently tapped with a wooden mallet till it is properly bedded and in level with adjoining tiles. There shall be no hollows in bed or joints. The joints shall be kept as close as possible and in straight lines. The joints between the tiles shall not exceed 1.5 mm wide. The joints shall be grouted with slurry of white cement mixed with colouring pigment to match colour of the tile as per the direction and approval of Engineer in Charge. After fixing the tiles finally in an even plane, the flooring shall be covered with wet sawdust and allowed to mature undisturbed for 7 days.

Cleaning :

After the tile have been laid in a room or the day's fixing work is completed, the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, the floor shall be carefully washed clean and dried. When dry, the floor shall be covered with oil free dry sawdust which shall be removed only after completion of the construction work and just before the floor is occupied.

Items to Include:

The rate shall include all labour, materials, tools and equipment required for the following operations to carry out the item as specified above :-

i. Providing and laying the bedding mortar and levelling

ii. Providing and fixing the tiles including round edges etc., in neat cement float over the bedding.

iii. Grouting the joints of the tiles with white cement slurry

iv. Filling the gaps between tiles with coloured cement slurry coloured with pigments to match the colour of tiles.

v. Curing for the required period as per the direction of the Engineer in Charge

vi. Cleaning the floor of any spillage and splashes of cement slurry, pigment and other dirt including spreading saw dust.

Mode of Measurement and payment:

Measurement for the work shall be in Sqmtrs correct to two places of decimal. The Contract rate shall be of the finished floor area including skirting, wherever provided, covered by the flooring of the specified type. All work shall be measured net. The length and Width of the flooring shall be measured net between the faces of skirting or dados or plastered faces of walls. Paving under the dado, skirting or plaster shall not be measured.

No deduction shall be made or extra paid for voids not exceeding 0.20 Smtr. Deduction for ends of dissimilar materials or other articles embedded shall not be made for area not exceeding 0.10 Smtr.

7.12 GLAZED TILES IN DADOOING

Providing and fixing Glazed tiles of any colour with size of 300 mm x 200 mm and 6.5 mm minimum thick for dado in required Positions, on plaster of cement mortar 1:4 including filling joints with white cement slurry mixed with pigments of approved quality to match the colour of the tile colour as per the direction and approval of the Engineer in Charge, curing and cleaning the tile after fixing as per directions of the Engineer in Charge

7.12.1 *Materials :*

Glazed tile including specials shall be of the approved make and quality and shall confirm to IS: 13755 in all aspects The Engineer shall approve the sample of the tiles, who will keep them in his office for verification as to whether the materials brought for use confirm to the approved samples.

7.12.2 *Plastering :*

Cement Plaster of about 15 mm for brick walls shall be applied to the part of the wall where dado or skirting is to fixed as per specification. The proportion of mortar shall be as mentioned in the item.

7.12.3 *Fixing of tiles:*

Dado work shall be done by only after fixing tiles on the floor. The glazed tiles shall be soaked in water for at least 2 hours before being used for dado work. Tiles shall be fixed when the cushioning mortar is still plastic but before it gets very stiff. The back of tiles shall be covered with a thin layer of neat cement paste and the tile shall then be pressed in the mortar and gently tapped against the wall with a wooden mallet. The fixing shall be done from the bottom of wall upwards without any hollows in the bed or joints. Each tile shall be fixed as close as possible to the one adjoining. The tiles shall be joined with white

cement slurry mixed with coloured pigments to match the tile colour as per the proportion of the manufacturer and directions and approval of the Engineer In Charge. Any difference in the thickness of tiles shall be evened out in cushioning mortar so that all tile faces are in one vertical plane. The joints between the tiles shall not exceed 1.5 mm in width and they snail be uniform. While fixing tiles in dado work, care shall be taken to break joints vertically. After fixing the dado, skirting etc. they shall be kept continuously wet for 7 days.

If doors, windows or other opening are located within the dado area, the sills, jambs, angles etc., shall be provided with glazed tiles and appropriate specials according to the foregoing specification and such tiled area shall be measured along with the dado.

7.12.4 *Cleaning :*

After the tiles have been fixed the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. After the complete curing, the dado work shall be washed thoroughly clean

7.12.5 *Item to Include:*

The rate shall include all labour, materials, tools and equipment required for the following operations to carry out the item as specified above.

(i) Plastering

(ii) Fixing the tiles after applying neat cement paste.

(iii) Joining the tiles with white cement slurry with matching colour pigments

(iv) Curing

(v) Cleaning the dadoing

7.12.6 *Mode of Measurement and Payment:*

Measurement for the work shall be in Sq.mtrs correct to two places of decimal. The contract rate shall be for the net area actually covered by the dado tiles including special on walls, jambs, sills etc. if necessary. All work shall be measured net. The length of the dado face shall be measured between its face edges at the ends excluding overlap. The width of the face shall be measured between the top of skirting and the top of flooring. The dimensions shall be measured correct up to two places of decimals of a meter and the area worked out shall be corrected up to two places of decimals of a Sq.mtr. No deduction shall be made or extra paid for voids not exceeding 0.2 Sq.mtr. Deduction for ends of dissimilar materials or other articles embedded shall not be made for areas not exceeding 0.10 Sq.mtr.

7.13 PROVIDING & LAYING PRE-POLISHED, MACHINE CUT CUDDAPAH STONE

Polished Cuddapah stone of specified thickness with machine cut edges shall be fixed in single piece on the kitchen platform or open shelves as directed. The stones shall be hand and wax polished. The laying procedure is same as specified in the item 7.13.3 above. Curing shall be done properly.

Mode of Measurement

Measurement shall be in sqm of the stones laid.

Providing & Fixing Cuddapah stone shelves

The stones shall be pre-polished on both the sides and the thickness shall be 25 to 30mm. The stones shall be placed in the brick masonary zarries and the same shall be finished properly.

Mode of Measurement

This shall be measured in sqm. The rate shall include providing Cuddapah stones, cutting zarries, placing the shelves, filling zarries, propping them till the CM sets and curing all complete.

7.14 PROVIDING & LAYING POLISHED GREEN KOTA STONE FLOORING

Stones shall be of approved quality, size and uniform thickness, edges shall be chisel dressed and the top surfaces shall be machine polished with joints running true and parallel from side to side. Stones should be laid on a bed of cement or lime mortar. The pattern of the flooring shall be as per the Architect's drawing. Thickness of mortar bedding shall be as specified in the item specification. The stone slabs shall be thoroughly wetted with clean water. Neat cement shall be spread over the mortar bed and the slabs shall be placed one by one, keeping in check the level and line of the flooring. The slabs are then gently tapped with wooden mallet till it is firmly and properly bedded. There should be no voids left. The joints should not be more than 2 mm thick. The joints should be struck smooth. If specified terrazo filling of specified thickness shall be done in the joints between the Kota stone slabs. The floor should be kept covered with damp sand or water for a week. Slabs should be of sizes as specified. The stone shall be machine polished and then cleaned with oxalic acid. If the Contractor is asked to mop the floor with kerosene and water by the Engineer, the same shall be done without any extra cost. This shall be carried out daily atleast for 10 times for 7 days.

Mode of Measurement

This shall be measured in sq m. The rate shall include providing and laying, curing, machine polishing, cleaning etc, all complete

7.15 PROVIDING & LAYING GREEN KOTA STONE SKIRTING

The stone shall be of required sizes and the thickness shall be as mentioned in the item specification. The stones shall be pre-polished and machine cut. The stone's edges shall be dressed fine true, straight and at right angles to each other. The stones shall be fixed over cement mortar bed 1:4 (1 cement: 4 coarse sand). The joints are filled with ordinary cement and its hand and wax polished. The joint between the top of skirting/dado and plaster shall be finished properly. The joints in the flooring shall be continued in the skirting/dado also. The work shall be cured properly.

Mode of Measurement

This shall be measured in sqm. The triangle skirting of staircase shall also be paid under this item. If mopping of the kota stone is asked to be carried out instead of wax polishing the same shall be carried out without extra cost.

Providing & Laying pre-polished, machine cut Kota stone in treads

Polished green kota stone of specified thickness with machine cut edges shall be fixed for treads of steps in single piece or on the kitchen platform or open shelves and window sills as directed. The stones shall be hand and wax polished. The laying procedure is same as specified in the item 6.06 above. Curing shall be done properly,

Mode of Measurement

Measurement shall be in sqm of the stones laid. If mopping of the kota stone is asked to be carried out instead of wax polishing the same shall be done continuously for ten days by the Contractor. It shall be done as specified in the item description in the Schedule of Quantities

7.16 PROVIDING & FIXING GREEN KOTA STONE SHELVES

The stones shall be pre-polished on both the sides and the thickness shall be 25 to 30mm. The stones shall be placed in the brick masonary zarries and the same shall be finished properly,

Mode of Measurement

This shall be measured in sqm. The rate shall include providing kota stones, cutting zarries, placing the shelves, filling zarries, propping them till the CM sets and curing all complete.

8. WOOD WORK

8.1 GENERAL

Wood work shall be neatly and truly finished to exact dimensions and details as per drawings, without patching or plugging of any kind. Rebates, roundings and mouldings as shown in drawings shall be made before assembling. Exposed work shall be finished smooth with well-planed faces.

All assembly of shutters of doors, windows, ventilators and frames thereof shall be exactly at right angles. In case of frames, the right angle shall be checked from the inside surfaces of the respective members.

All door and window frames shall be clamped together so as to be square and flat at the time of delivery. Door frames without sills shall be fitted temporary stretchers. Horns of frames and other parts that go into or butt against moisture and decay with two coats of coal tar other approved protective material. All surfaces of the door, window and ventilator frames and shutters which are required to be painted ultimately shall be covered evenly by brush with a priming coat of approved primer. In case of doors to be polished or varnished, a priming coat off approved polish or varnish shall be given before delivery. No primer shall be applied to the woodwork until it has been inspected and passed by the Project Consultants.

8.2 JOINERY

Applicable Codes

IS:4351	-	Steel door frames
IS: 1 038	-	Steel door, windows and ventilators.

Providing & Fixing Pressed steel frames for doors

They shall be made of hollow metal pressed section of approved make such as "Perfect Industrial Products", TIL or of any approved make. They shall be single / double rebated as per the Architect's drawing. It shall be made of CR sheet and size 65 x 125 x 1.2 mm thick. It shall be provided with four hinges of 125x2 mm thick of friction type. Four hinges shall be provided per leaf of the door. The frame shall be provided with 6 holdfasts of size 250 x 30 x 3mm mm for each side and the same shall be embedded in brick work with CC 1:3:6. The hollow portion of the frame shall be filled with CC 1:3:6 before it is fixed. The frame shall be painted with red oxide primer. There shall be provision in the frame for fixing of tower bolts, aldrop, lovres, mortice lock etc. The frame shall be painted with two or more coats of approved synthetic enamel paint to get a uniform finish.

All heads, posts, transoms and mullions etc., of doors, windows and ventilators shall be made out of single piece of timber only. The heads and post shall be through tenoned into the mortises of the jamb posts to the full width of the latter and the thickness of the tenon shall be not less than 1.25 cm. The tenons shall be close fitting into the mortises and pinned with corrosion resisting metal pins not less than 8 mm diameter or with wood dowels not less than 10 mm diameter. The depth of rebate in frames for housing the shutters shall in all cases be 1.25 cm and the rebate in shutters for closing in double shutter doors or windows shall be not less than 2 cm. Unless otherwise specified, all joints shall be mortise and tenon joints with the ends of the tenons exposed to view. Joints shall fit truly and fully without fillings The contact surfaces of tenons and mortises shall be treated, before putting together, with an approved adhesive conforming to IS:848-1974 and 851-1978

8.3 SHRINKAGE & TOLERANCE

The arrangement, joining and fixing of all joinery work shall be such that shrinkage in any part in any direction shall not impair the strength and appearance of the finished work.

The tolerance on overall dimensions shall be within the limits prescribed in IS 1003 (Part 1 72) - 1983 to 1991

8.4 FIXING

Door and window frames shall generally *be* built In at the time the walls are constructed. Alternatively, where permitted by the Project Consultants. the frames may be subsequently fixed into prepared openings which purpose holes to accommodate the holdfasts shall be left at the time of construction. Where the frames are subsequently fixed into prepared openings width of the door, window or ventilator frame to allow minimum 12 mm plaster on each Jamb The height of the unfinished opening shall depend upon whether a threshold IS required or not While fixing the door care shall be taken to see that at least 6 mm space is left between the door and the finished floor. The M.S. clamps fixed to the frame shall be inserted in the holes and jammed in cement concrete M-15 or (1 :2:4 mix) with 20 mm down graded stone chips after holding the frame in proper position to the line, level and plumb.

The size of the concrete block shall be 250 x 125 x 85 mm unless otherwise specified.

8.5 TARRING

Timber in contact with earth, concrete, plasters or masonry shall be treated with boiling coat tar or 2 coats of wood preservative treatment like hot solingnum or creosote oil etc. before fixing the frame in position.

8.6 FITTINGS

Unless otherwise specified, three holdfasts shall be fixed on each side of a doorframe, one at the centre point, and the other two at 30 cm from the top and bottom of the doorframes. In the case of windows and ventilators, a pair on each side shall be fixed at quarter portion of the frames. Unless otherwise specified the holdfasts shall be of mild steel plate 40 x 3 x 225 mm long, fish tailed at one end and screwed to the frame in the formed rebates.

Generally, each door shutter shall be fixed to the frame with three hinges of approved manufacture, one at the centre and the other two approximately 24 cm from the top and bottom of the shutter. Each window shutter shall be fixed to its frame with two hinges at the quarter points.

Locks, handles, door closers, stoppers etc., shall be fitted as shown in drawing or described in the Schedule of Items.

8.7 DOORS, WINDOWS & VENTILATORS ETC.

Dimensions of the various components of doors, windows and ventilators shall be in

accordance with IS:1003 (Part 1 & 2) -1983 to 1991 table - III or as shown on the drawings. The work shall be carried out as per detailed drawing. The wooden members shall be planned, smooth and accurate. They shall be cut to the exact shape and size without patching or plugging of any kind. Mouldings, rebates, curves and roundings etc. shall be done in the drawing before the pieces are assembled into the shutter.

The thickness of stiles and rails etc. shall be as per IS:1003 (Part 1 & 2) -1983-1991 unless otherwise specified in the item of works. These shall be properly and accurately mortised and tenoned. Rails which are more than 180 mm in width shall have 2 tenons. Stiles and rails shall be made out of single piece upto 200 mm in width In case more than one piece of timber is used for members exceeding 200 mm width, they shall be joined with a continues tongued and grooved joint, glued together and reinforced with rust proof metal dowels or headless pins. The tenons shall pass clear through stiles The stiles and rails shall have a 12 mm groove, unless otherwise shown in the drawing, to receive the panel. In case of double shutters shall be as per clause 5.5 of IS: 1 003- 1991 or as shown in the drawing. Primer coat shall not be put before shutters are passed by the Project Consultants.

8.8 PANELLED SHUTTERS

These shall conform to IS 1003 (Part 1) - 1991 Timber panelled shutters shall be constructed in the form of timber frame work of stiles and rails with panel inserts of timber, plywood, block board, veneered particle board, hard board or asbestos cement board.

Stiles, rails and panels in door shutters shall be of the same species wood.

Timber panels shall be of minimum width of 150 mm. When made from more than one piece, the pieces shall be jointed with a continuos tongued and grooved joint, glued together and reinforced with metal dowels. No single panel shall exceed 0.5 m2 in area. Timber panels shall be fixed only with grooves but additional beadings may be provided either on one side or both sides.

Unless otherwise specified thickness of panel for 35 mm thick shutter shall be 15 mm and for 40 mm and above thick shutter, it shall be 20 mm. For 25 mm thick shutter, panel thickness shall be 12 mm.

Apart from timber panels other materials like plywood, block board, particle board and asbestos cement may also be used for panelling purpose and shall be fixed with grooves or beading or both as per provisions made in IS: 1 003 (part 1)-1991.

Timber suitable for manufacture of door shutter have been grouped under class a, b, c & d in Table 1 of IS:1003--(Part 1)-1991.

8.9 GLAZED SHUTTERS

The openings for glazed shutters shall be rebated and moulded out of solid timber. Plain sheet glass for panels shall be of approved quality as specified. Wherever specified, ground glass or frosted glass of approved quality shall be used in place of plain sheet glass. Unless otherwise specified glass panes shall be fixed by means of moulded beads and suitable MS panel pins. A thin layer of putty shall be applied between glass panes and sash bars and also between glass panes & beading.

8.10 FLUSH DOOR SHUTTERS

Unless otherwise specified, flush door shutters shall have a solid / cellular core, a teak wood frame, and shall be faced with approved quality of plywood on both faces. The core and stock shall be made from well seasoned approved timber and treated with approved preservatives. The plywood faces shall be glued on to the solid / cellular core with waterproof glue under pressure and heat. The construction of flush doors shall be such that no difficulty should arise in fixing mortise locks, hydraulic door leaf doors. Where specified flush doors shall be provided with vision panels, rectangular / round or louvered.

If specified so, the flush door shall be solid block board core or solid particle board core construction. The workmanship and overall finish shall be of very high standard and shall

conform to IS:2191 (Part 1 & 2)-1983 & 2202 (Part 1& 2)-1983-1991. The shutters shall be procured from approved manufacturer bearing IS certification mark only.

8.11 HAND RAIL AND FITTINGS

8.11.1 WOODEN HAND RAILS

Wooden handrails shall be of approved quality teak wood fixed to concrete or me' balustrade with concealed steel or metal lugs and bolts as per drawing. Joints will made with concealed screws and dowels. All bends, miters, covers, moulds etc., will be strictly to proper profile and finally smoothened by sand paper. The hand rail shall be finished with wax or french polish as per direction of the Project Consultants.

8.11.2 HARDWARE FITTINGS FOR DOOR, WINDOWS & VENTILATORS

All mortise or rim locks, latches, cabinet and wardrobe locks, hydraulic door closers, floor springs etc. shall be of Godrej, Everite make or of similar approved make. The rate shall include for all necessary screws, other adjuncts, fixing in position and is for the completed work. The finish shall be as specified in the schedule of quantities. Door, window and ventilator fittings shall be as per specifications already described. The rates for doors, windows and ventilator shutters shall include the cost of fixing the fittings, with the necessary screws to the shutters and the frame. The cost of fittings only shall be paid separately. Where specified in the schedule of quantities, the cost of fittings shall be included in the rates for doors, windows and ventilator shutters. In such cases the contractor shall supply and fix the various fittings strictly to the standard laid down in the schedule of hardware and no separate payment for this shall be made.

8.12 INSPECTION

The Contractor shall provide all facilities to the Project Consultants for the inspection of the goods at his premises. No premier shall be applied until the wood work has been inspected and passed by the Project Consultants. The Project Consultants shall have the option of rejecting any article or asking for replacement of any article found to be defective or not complying with the requirements of this specification and the relevant Schedule of Items.

9. METAL DOORS, WINDOWS,

9.1 GENERAL

Doors, windows and ventilators etc., shall be truly square and flat, i.e., free from twist and wrap. The general fabrication shall conform to IS:1038-1983 and IS:1961-1978 as applicable

9.1.1 Frames shall be constructed of sections which have been cut to length and mitered. They shall be mortised, reinforced, drilled and tapped for hinges and lock and bolt sticks. Where necessary, frames shall be reinforced for door closers. Flash butt welding or any other suitable method which gives the desired requirement, with mitered corners shall be used. Rubber door silencers shall be furnished for the striking jamb. Loose “T” masonry anchors shall be provided Frames shall finish flush with floor and adjustable floor anchors shall be supplied. Frames shall be brought to site with floor ties / weather bars installed in place. All frames shall be square and flat. Door thresholds shall be provided as shown on drawing. Doors without threshold shall have bottom tie of approved type.

9.1.2 The Contractor shall first submit for the approval of the Project Consultants, the name and address of the manufacturer whose metal casements and doors and windows he intends to use, together with typical drawings and specifications,

describing their details of construction for each type of door/window/ventilator etc

9.1.3 All steel doors, windows and ventilators shall be either galvanised or painted. All steel surfaces shall first be thoroughly cleaned free of rust, scale or dirt mill scale by pickling or similar process and then shall be painted with one coat of an approved primer conforming to IS:102 -1962 before despatch. Alternatively they may be galvanised by the "Hot Dip" zinc spray or electro-galavanising process as described in IS:1361-1978.

9.2 FIXING

Doors, windows and ventilators shall not be built in at the time the walls are constructed but shall be subsequently fixed into prepared openings as laid down in IS:1081-1960. Holes to accommodate the fixing lugs are to be left or cut, and the casements fixed after all the rough masonry and plaster work have been finalized. The lugs of the casement shall be Jammed in cement concrete (15 C Mark) / (1 :2:4) mix after holding the casement in proper position, line and level.

The width of the clear unfinished opening in the wall should be 25 mm more than the overall width of the door frame to allow for plaster on each jamb. The height of the unfinished opening shall depend upon whether a threshold is required or not. While fixing the door, care shall be taken to see that at least 6 mm space is left between the door and the finished floor.

9.3 FITTINGS

Hardware shall be fixed as late as possible, preferably just before the final coat of paint is applied. It shall be fitted in a workmanlike manner, so that it may not work loose and in such a way that screws and pins are not marked and mutilated by hammers and screw drivers. It shall be tested for correct operation. Where specified, doors shall be fitted with a three-way bolting device which can be operated from outside as well as inside, and a locking system, which can similarly be operated from either side. Solid steel bolt handles shall be provided, one on the outside and one on the inside of each shutter. In case of doors provided with a service door, the lock shall be fitted on the service door. All materials shall be the best procurable and shall be approved by the Project Consultants.

9.4 NORMAL STEEL PLATE DOORS

Steel doors may be of the hinged type or sliding *I* folding type, single shutter or double shutter, and of single-walled or double walled construction, as specified on the drawings or Schedule of Items. All doors shall be provided with a sturdy frame and hold fasts for fixing into the wall. Unless otherwise specified, the frame shall be prepared from mild steel angles of size not less than 65 X 65 x6 mm electrically welded at the corners and the shutter shall be made from flat steel sheet of gauge or 1.25 mm thickness with a frame of mild steel angles not less than 50x50x6mm all round, suitably braced. The whole shutter shall be of welded construction and shall be hung at the sides by means of three or four hinges as specified.

9.4.1 DOUBLE PLATE FLUSH DOOR SHUTTERS

Door shutters shall be 45 mm thick, completely flush design and shall comprise of two outer sheets or 18G or 1.25 mm thick steel sheets, rigidly connected and reinforced inside with continues vertical 20G or 0.99 mm thick stiffeners, spot welded in position at not more than 150 mm on centers. Both edged of doors shall be joined and reinforced full height by steel channels placed immediately inside and welded to the door faces. Top and bottom of doors shall be reinforced horizontally by steel channels running full width of door. Doors shall not have more than 2.5 mm clearance at jambs and head, shall have proper level on the lock

stiles and rails and shall be reinforced at corners to prevent sagging or twisting. Pairs of double doors shall have meeting style edges beveled or rebated. Where shown on drawing, or in the Schedule of Items, the doors shall be sound deadened by filling the inside voids with mineral wool or other suitable approved materials. Doors shall be mortised, reinforced, drilled and tapped in shop for hinges, locks and bolts. They shall also be reinforced for closers, push-plates and other surface hardware's where necessary. Any drilling and tapering required for surface hardware shall be done at site. Where shown in drawing, provisions, shall be made for fixing glazing, vision panels, louvres, etc. Glazing mouldings shall be of 18G or 1.25 mm thick steel or extruded aluminium sections with profiles shown in drawing and suitable for fixing 6 mm glass. Louvre blades shall be V or Z shaped sections.

9.4.2 SINGLE SHEET DOOR SHUTTERS

Single sheet doors shall be made from best quality 18G/1 mm mild steel sheets, and shall present a flush surface on the outside. The inside shall be stiffened with a semi tubular edge and central stiffening rail which shall convey the lock and other fixture, The frames shall be made from best quality steel sections, Wherever required or shown on drawings, provision for fixing glass panes, louvers etc., shall be made,

The manufacturing shall be done as specified in "Double. Plate Flush Door Shutters"

9.5 PRESSED STEEL DOORS

All pressed steel doors shall be obtained from an approved manufacturer. The frame and shutters shall be fabricated from cold rolled or pressed steel sections, Unless otherwise specified, the thickness of all sheets used for frames shall be not less than 5 mm. The shutters shall be made of sheet steel of 2 mm thickness for single shutter doors and double shutter doors with or without service door. The plates shall be adequately stiffened with suitably placed stiffeners,

The double walled door shutter shall consist of two plates each 2.5 mm thick, separated by a gap of 33 mm in between making an overall thickness of 38 mm or as shown in drawing. The plates shall be adequately stiffened by means of suitably spaced horizontal steel stiffeners.

9.6 STEEL WINDOWS, SASHES, VENTILATORS, ETC.,

These shall conform to IS·.1038-1983 and IS'1361-1978 as appropriate and as shown in drawings. The details as called above codes shall be applicable for coupling mullions, transoms, weather bars, pivot arrangements for ventilators, etc

9.6.1 Where composite unit openings are shown in drawings, the individual window units shall be joined together with requisite transoms and mullions Where aluminium glazing beads are specified, they shall be extruded aluminium channel 9.5 mm x 1.6 mm (Indal Section No. 2209) unless otherwise shown in drawings. Aluminium beads shall be given one coat of zinc chromate primer before fixing to windows.

All welds at the corner of casement shall be done by flush butt welding process or any other suitable method which gives the desired requirement and dressed flush on all exposed and contact surfaces.

9.7 COLLAPSIBLE GATE (STEEL)

Mild steel collapsible gates shall be obtained from an approved manufacturer. These shall be of mild bar type made out of double channels each 20 x 10 x 2 mm with 20 x 5 m

diagonals and shall be top hung with roller bearings, and fitted with locking arrangement.

Collapsible gates under 3.0 metre height shall generally have 3 sets of lattices and those over 3.0 metre height, 4 sets of lattices. Guides tracks shall be fitted at the top and bottom, of T-iron 40 x 40 x 6mm with 40 mm dia bearings in every fourth double channel.

9.8 ANODIZED ALUMINIUM WINDOWS

Workman ship

9.8.1 Minimum average thick of anodizing (coating of anodizing) on all aluminium sections and fittings shall be 15 microns and shall confirm to IS 1868-1983

9.8.2 Testing of anodizing coat shall be in accordance with IS 5523 -1983.

9.8.3 PVC protected sheeting shall be used for anodized sections while fixing the frame of window to avoid damages, scratches etc.

9.8.4 Final fixing shall be done with the prior approval of the Engineer in charge

9.8.5 Sections

All the sections should confirm to Designation 63400 given in IS 737-1986 and according to the specification in the BOO's sizes of the sections shall be used with the prior approval of the Engineer in charge.

9.8.6 Clips

The clips used shall be of 0.70 mm thick anodized as specified in the BOO with the approval of the Engineer in charge.

9.8.7 Nepron Gaskets.

The nepron gaskets used of shall be first and best quality and should be got approved from the Engineer in charge before using.

9.8.8 Mode of Measurement

Anodized aluminium windows:

The width and height shall be measured from out to out of frame of shutter to the nearest 0.5 cm

Aluminium section, anodisation, testing of anodisation etc., fixing of shutters shall be all as described in clause 8.1

10. Glazing

10.1 GENERAL

Glazing shall be done with plain, frosted, ground glass or wired cast glass, laminated safety glass or toughened glass etc., as shown on drawings, described in the Schedule of Items or approved by the Project Consultants. The method of glazing adopted shall be such that movement of the structure, to which the securing is done, does not transmit strain to windows, doors and ventilators as the case may be. The work shall generally conform to IS:1081-1960 "Code of Practice for fixing and glazing of Metal Doors, Windows & Ventilators". The material for putty shall consist of whiting and linseed oil, raw mixed in such proportion as to form a paste conforming to IS:419-1967.

10.2 DOORS, WINDOWS AND VENTILATORS

Windows and ventilators shall be designed for putty glazing fixed from outside and glazed doors for fixing from inside. In addition, spring type glazing clips shall be provided

at intervals of 30 cm, or as shown otherwise on drawings or described in Schedule of Items. These shall be inserted into holes drilled in the shutters or frames as the case may be.

All glazing shall be puttied to the shutters of frames with good quality putty in addition to glazing chips. Glass panes shall not be placed directly against the metal/timber. A thin layer of putty shall be even spread over the glazing rebate and the glass pressed firmly against it It shall be secured in position by means of teak wood beads for wooden shutters Glass panes shall be set without springing & shall be bedded in putty and back puttied, except where moulding or gasket are specified. Putty mastic cement etc. shall be smoothly finished to even lines. Figured glass shall be set with smooth side out. After completion of glazing work, all dirt stains, excess putty etc., shall be removed and the glass panes shall be left in perfectly acceptable condition. All broken cracked or damaged glass shall be replaced by new ones at the Contractor's cost.

11. WHITE WASHING, COLOUR WASHING & PAINTING

11.1 SCOPE

This chapter deals with white washing, colour washing, distempering, cement washing, emulsion painting, silicate painting etc. to concrete and masonry surfaces and painting to the wood works and steel works. For the items which have not been completed or partly covered in this chapter, specifications suggested by the manufactures for the materials, surfaces preparation, workmanship and all by-works shall be strictly followed and shall be carried out as per direction of the Project Consultants.

11.2 MATERIALS

Materials shall conform to Part - I.

11.3 WHITE WASHING

11.3.1 Wherever scaffolding is required / necessary, it shall be erected on double support tied together by horizontal pieces, over which the scaffolding planks shall be fixed. No part of it shall rest on or touch the surface which is being washed / painted. Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damage or scratches to walls. For white washing the ceiling, proper stage scaffolding shall be erected. The surface on which wash is to be applied shall be thoroughly brushed free from mortar droppings and foreign matter.

11.3.2 WHITE WASH

The wash shall be prepared from fresh stone white lime of approved quality and shall be thoroughly slaked on the spot mixed and stirred with sufficient water to make a thin cream. This shall be allowed to stand for 24 hours and then shall be screened through a clean coarse cloth 4 kg of gum dissolved in hot water shall be added to each cubic metre of the cream.

The approximate quantity of water to be added in making the cream will be 5 litres of water to 1 kg of lime. Indigo / ultramarine blue upto 3 gm per kg of lime dissolved in water shall then be added and wash stirred well. Water shall then be added at the rate of about 6 litres per kg of lime to produce a milky solution. The white wash shall be applied with approved brushes to the specified number of coats. The operation for each coat shall consist of stroke of brush given from the top downwards, another from the bottom upwards over the first stroke and similarly one stroke horizontally from right and another from the left before it dries. The white washing on ceiling shall be done prior to that on walls.

Each coat shall be allowed to dry before the next one is applied and shall be subjected to inspection and approval by the Project Consultants. No of which it shall be mixed in two stages. The first stage shall comprise of 2 parts of water proof cement paint and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall be taken to add the paint gradually to the water and not vice-versa. The second stage shall comprise of adding further one part of water to the mix and stirring thoroughly to obtain a liquid of workable and uniform consistency. The paint shall be mixed in such quantities as can be used up within an hour of its mixing.

Paint shall be applied with brushes or spraying machine. The solution shall be kept well stirred during the period of application. It shall be applied as far as possible on the surface which is on the shady side of the building so that direct heat of the sun on the surface is avoided. Painted surfaces shall be sprinkled with water 2 or 3 times a day. This shall be done between coats and for at least 2 days following the final coat. The curing shall be started as soon as paint has hardened so as not to damage by sprinkling of water say about 12 hours after the application. A uniform shade should be obtained after application of paint. Cement paint shall not be applied on surfaces already treated with white wash, colour wash, distemper, varnish paint etc. and on gypsum, wood and metal surfaces.

11.3.3WHITE WASHING WITH WHITING

Whiting (ground white chalk) shall be dissolved in sufficient quantity of warm water and thoroughly stirred to form a thin slurry which shall than be screened through a clean coarse cloth.2 kg of gum and 4 kg of copper sulphate dissolved separately in hot water shall be added for every cum of slurry which shall then be diluted with water to the consistency of milk so as to make wash ready for use Other specification remains same as per white washing with lime

11.4 CEMENT PRIMER COAT

The surface shall be thoroughly cleaned of dust, mortar, droppings etc. and shall be allowed to dry for at least 48 hours. It shall then be rubbed thoroughly be sand paper to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of paris mixed with water on the entire surface including filling up the undulation and then sand papering the same after it is not by spraying Horizontal strokes shall be given first and vertical strokes shall be applied immediately, afterwards This entire operation will constitute one coat The surface shall be finished as smooth as possible, leaving no brush marks.

11.5 WATER-PROOF CEMENT PAINT

The prepared surface shall be thoroughly wetted with cleaned water before water proof cement paint is applied. The paint shall be prepared strictly as per manufacturer's specifications, in the absence are found necessary shall be applied to obtain an even shade. A time interval of at least 24 hours shall be allowed between consecutive coats. The brushes shall be of 15 cm double bristled type. They shall be maintained in proper condition and those that are dirty or caked will not be allowed to be used. The finished surface shall be even and uniform without patches, brush marks, distemper shall be mixed to finish one room for applying one coat in operation.

11.6 OIL BOUND DISTEMPER

The surface shall be prepared as for Cement Primer Coat A primer coat of cement or distemper primer shall be applied as specified in the description of item Unevenness In the plaster shall be made good by applying plaster of paris putty mixed with distemper of the colour to be used on the entire surface including filling up the undulations The surface shall then be rubbed down with a fine grade sand paper and made smooth. After the prime coat has dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth, taking care not to rub the priming coat out All loose particles shall be dusted off. One coat

of distemper properly diluted with thinner, shall be applied with brushes / rollers in horizontal strokes followed immediately by vertical ones which together constitute one coat. The subsequent coats shall be applied in the same way. Two or more coats of distemper as portion of the surface shall be left out initially to be patched up later on.

The finished dry surface shall not show any signs of cracking and peeling nor shall it come off readily on the hand when rubbed. Doors, windows, floors and such other parts of the building not to be white washed shall be protected from being splashed upon.

11.7 PAINTING TO TIMBER & STEEL

11.7.1.1 GENERAL

The priming coat for steel/wood work shall be applied after the surface has been prepared. After the priming coat has dried, all nails, screws holes and cracks shall be filled putty and surface smoothened with sand paper.

All surfaces must be thoroughly dry before painting work is started and painting in exterior / exposed parts shall not be taken up in wet / humid or otherwise unfavorable weather.All stains of paint to glasses, walls, fittings and fixtures etc. shall be cleaned thoroughly by applying required turpentine or thinner. The contractor's rate shall include all these.

11.7.1.2 PAINTING TO TIMBER

(i) Unless otherwise specified, all timber surfaces shall be treated with one priming coat, one under coat and one finishing coat. Under coat and finishing coat shall be synthetic enamel or as specified. Priming coat shall be approved primer. In case the surface is to be polished or varnished, a priming coat as approved or specified shall be given. No primer shall be applied to wood work until it has been inspected and passed by the Project Consultants.

11.8 PAINTING TO STEEL

11.8.1.1.1 *General*

All surfaces shall be thoroughly cleaned of all dirt, grease, rust and mill scale. Areas which become inaccessible after assembly shall be painted before assembly after cleaning the surfaces as described above. The surfaces shall be perfectly dry before painting.

Wherever shop primer painting is damaged, the surfaces shall be thoroughly cleaned and touched up with corresponding primer.

Site painting shall not be done in frosty or foggy weather or when humidity is such as to cause condensation on the surface to be painted.

11.8.1.1.2 STEEL STRUCTURES

Unless otherwise specified all structures shall be painted with two coats of primer. One coat shall be applied at shop and the second coat at site. All structures after erection shall be given two coats of finishing paint and shall be of synthetic enamel of approved colour. The under coat shall have different tint to distinguish from the finishing coat.

11.8.1.1.3 STRUCTURES EMBEDDED

Exposed surfaces of embedded parts shall be given two coats of red lead graphite primer at shop and finished with *t\"IO* coats of anti-corrosive paint at site after embedment, type of paint and procedure of painting shall be as per manufacturer's specification. Surfaces to be field welded shal1 have no paint applied within 100 mm of the welding zone

12. INTERNAL WATER SUPPLY, PLUMBING, DRAINAGE AND SANITATION

12.1 Scope of Work

The work comprises supply, laying, testing, commissioning etc.of water supply, plumbing, drainage & sanitation.

The work includes the following activities connected with the job :-

viii. Supply and delivery of all required pipes and other materials

ix. Earthwork in excavation for trenches, pits/chambers/manholes etc

x. Civil works connected with the laying/erection of pipe lines such as making holes in the wall etc. and repairing them after pipe erection, construction of pipe supports, valve chambers, manholes, bedding and covering of pipe laying wherever required.

xi. Laying and jointing of pipe lines as specified in this chapter.

xii. Testing of pipe lines after laying as per standard tests specified in this chapter

xiii. Back filling of trenches after successful and satisfactory testing.

xiv. Back filling of trenches after successful and satisfactory

testing. viii. Commissioning of entire network

x. Safe custody of the pipes/materials/equipment/work and other obligation stated elsewhere in the specification.

xi. Any other activities which are not mentioned above but essential and required.

12.1.1 MATERIALS

The materials shall conform to Part – I of this series.

12.2 Water Supply & Plumbing

12.2.1 GENERAL REQUIREMENTS

The contractor shall lay all the pipes and fittings in the best workman like manner by skilled workmen and licensed plumbers in conformity with the regulations and requirements of the local appropriate authorities and to the satisfaction of the Project Consultants. Unless otherwise specified water supply works in buildings shall be carried out in accordance with 18:2065-1983 "Code of practice for Water Supply in Buildings" & IS:2064-1993 "Code of practice for selection, installation and maintenance of sanitary

12.2.2 INSTALLATION

All works like earth work, masonry, concrete, steel work, cutting holes, chases in brick, concrete & RCC works, cutting of roads, repairs and rectification's associated directly with the installation of water supply system shall come under the scope of the Contractor and shall be governed by the specification of the relevant chapter.

12.2.3 LAYING

Before lowering down for laying in the trenches, the pipes shall be checked against crack by means of light hammering and for any other damage. All fixing shall be

carefully aligned and spaced at a distance from the main structure to give reasonable all round access for maintenance and inspection and laid true to line plumb and level Any deviation shall need approval of the Project Consultants. Meticulous care shall be taken to avoid chances of airlock and water hammer.

Pipes shall be laid on continues unyielding surface holder or on reliable supports at least one near each joint and spacing as directed by the Project Consultants. The support must be strong, neat and shall have provisions for securing the pipes in every direction and easy maintenance. !f situation requires, pipes shal1 be encased or concealed in masonry or concrete if shown on drawing or directed by the Project Consultants. Pipes embedded in floors and wal1 shall be securely bound so as not to allow any movement due to expansion and contraction. Adequate width shall be provided to lay the pipes as per standard practice.

Excavation below the required level is not permitted. The contractor shall make good any excess excavation as directed by the Project Consultants. Soft spots in the bottom of beds for pipe lines in rock shall be leveled with sand or soft soil or concrete as approved by the Project Consultants and the thickness of the layer shall not be less than 100mm.

12.2.4 EXCAVATION FOR PIPE IN TRENCHES:

Excavation shall comply with chapter 2. The sides of pits and trenches shall be adequately supported at all times, except where otherwise directed by the Project Consultants.

12.2.5 UNDERGROUND PIPING IN AND AROUND BUILDING

Underground piping shall be laid at such a depth that it is not likely to be damaged by traffic and other loads and frost, where applicable, and as shown in the drawing and instructed by the Project Consultants. The thrust blocks shall be provided wherever required

The size and depth of the trench shall be as approved by the Project Consultants. Backfilling in trenches shall be done with selected fine earth, unless otherwise permitted, in 150mm layers and carefully consolidated and well treated so that it does not set as a drainage. Special care shall be taken while filling in the vicinity of the pipe to avoid damages. Before backfilling the laid pipe shall be fully tested and approved.

12.2.6 CONCEALED PIPING

Where desired by the Project Consultants or shown on the drawings the pipes shall be concealed in masonry or concrete of the adjoining structure by making chases in walls/floors and these shall be secured by hooks and the chases filled with concrete 1:2:4 (1 cement, 2 sand and 4 aggregate) The Contractor will rectify, if required the chases, openings and pipes, supplement and make good after laying and testing of the concealed pipelines.

12.2.7 GI PIPING

12.2.7.1 The pipes shall be fixed in longest lengths possible with all necessary bends, tees, couplings, reducing sockets, short piece, jamnut and tees etc., in perfect straight lines both vertically and horizontally.

12.2.7.2 All exposed GI pipes shall be fixed at least 15mm clear of wall face with holder bat clamps at suitable places not exceeding (2.5 metres) centre to centre Where the pipes are laid in chases in walls as shown in

the drawing, these shall be secured to walls by hooks Chases in walls and floors shall be filled in with cement concrete 1:2:4 Where the pipes are to be run underground these may laid at least 60 cm below ground level.

12.2.7.3 The joints of pipes and fittings shall be sealed with red lead paint and fine spun yarn. Joints must be perfectly water tight when put under maximum test pressure.

12.2.7.4 Unless otherwise specified the exposed portion of pipes and fittings shall be given two coats of approved synthetic enamel paint over a coat of approved priming. Pipes laid underground or concealed in walls/floors shall be treated with two coats of bituminous paint.

12.2.8 JOINTING OF PIPES

The interior of all pipes and joints shall be cleaned before jointing commences. Jointing of pipes shall be done in such a manner as to render them completely leak proof and durable. Instruction of the manufacturer shall be followed unless desired otherwise by the Project Consultants. However, the general norms and recommended practices for different types of pipes are given below for guidance:

a). G.I.PIPES

Threads shall be cut with, sharp tools, and before jointing all scale shall be removed from pipes by suitable means. The screw threads of the pipe shall be cleaned out and the joint made by screwing the fitting after treating the threads with approved pipe jointing compound. Once a joint has been screwed up it shall not be backed off unless threads are recleaned and new compound applied.

12.2.9 PRECAUTIONS

a. All water supply pipes shall be so laid and so fixed and maintained as to be and remain completely water tight.

b. During installation open ends of each pipe shall be protected by suitable covers or plugs so that the ends, thread, sockets or spigot are not damaged and no foreign materials can make its way into the pipe line.

c. Due care should be taken to ensure that there shall be no cross connection whatsoever between a pipe or fitting for conveying or containing wholesome water and a pipe or fitting containing impure water or liable to contamination or of an uncertain quality of water which has been used for any other purposes.

d. Fittings and fixtures liable to be stolen shall be fitted and fixed just before testing and handling over.

12.2.10 PAINTING

When mentioned in the schedule of item underground steel and cast iron pipes shall be treated with 2 coats of anticorrosive bituminous paint on the outside surface after cleaning the surface from soil, dust, moisture, rust, scales soot etc. When painting is to be done for pipes above ground, G.I. pipes shall be given a coat of zinc chromate primer, C.I. & M.S. Pipes shall be given one coat of red lead or zinc chromate primer over which at least 2 coats of paint of best quality and manufacture as approved by the Project Consultants shall be provided or as specified in the schedule of item

12.2.11 FERRULE AND STOP COCK BOX WITH CHAMBER:

Square cast iron surface box 15 cm square and 22 5 cm weighing not less than 4.54 kg with hinged lid shall be provided in masonry chamber. Top of box shall be made flush with the finished level of the chamber. The chamber 25cm x 25cm inside shall be with half brick wall in cement mortar 1:4 over a cement bed concrete

of 75mm thick in proportion 1:4:8 with stone chips. The inside wall faces shall be plastered with 12mm thick cement mortar 1:4 finished smooth with a floating coat of neat cement.

The exposed surfaces of cast iron box and cover shall be treated with two coats of bituminous paint.

12.2.12 INSPECTION, TESTING AND ACCEPTANCE

12.2.12.1 PIPES, FITTINGS AND FIXTURES BEFORE LAYING

All pipes, fittings and appliances shall be inspected, before delivery at the site to see whether they conform to accepted standards. The pipes and fittings shall be inspected on site before laying and shall be sounded to disclose cracks. Any defective items shall be clearly marked as rejected and forthwith removed from the site.

12.2.12.2 TESTING OF PIPES AFTER LAYING

General

a. The Contractor shall ensure the safety of the pipe under test and provide all necessary stoppers, testing apparatus etc. that are required for testing

b. The Contractor shall be responsible for any damage done to pipe work and ancillary work while testing and shall replace any pipe or fitting which does not satisfactorily withstand the test.

c. The Contractor shall give written notice of the times at which tests are to take place. On completion of each test two copies the complete records shall be given to the Project Consultants.

d. The work will not be considered complete until the tests are found satisf3ctory and a certificate issued by the Project Consultants

After laying and jointing, the main shall be slowly and carefully charged with water, so that all air is expelled from the main by providing a 25 mm inlet with a stop-cock, allowed to stand full of water for a few days if time permits and then tested under pressure. The test pressure shall be 6kg/cm2 or double the maximum working pressure whichever is greater. The pressure shall be applied by means of a manually operated test pump, or in the case of long main or a large diameter, by a power driven test pump, provided that pump is not left unattended. In either case due precaution shall be taken to ensure that the required test pressure is not exceeded. Pressure gauges shall be accurate and shall preferably have been recalibrated before the test. The pump having been stopped, the test pressure shall maintain itself without measurable loss for at least five minutes. The end of the main shall be closed by fitting a water-tight expanding plug and the plug shall be secured by struts to resist the end thrust of the water pressure in the mains.

12.2.12.3 TESTING OF SERVICE PIPES AND FITTINGS

The service pipes shall be slowly and carefully charged with water allowing all air to escape avoiding all shock or water hammer. The service pipe shall then be inspected under working conditions of pressure and flow. When all draw-off taps are closed, the service pipes shall be absolutely watertight. All pipings, fittings and appliances shall be checked for satisfactory support and protection from damage corrosion and frost.

12.2.13 STORAGE TANK

Tanks unless otherwise specified shall be provided with rising main inlets of 40 mm dia. galvanised iron pipe more as shown on drawing and 40 mm dia. G.I. overflow pipe and 25 mm washout with plug. If specified the rising main shall be connected to the tank with a ball valve near the top which disconnects the supply when tank is full up to the point of overflowing.

The ball valve shall permit the entry of water when the tank is empty and disconnect the supply when the tank is full. It consists of a hollow floating ball made of copper, plastic or hard rubber, 110 mm diameter attached to an arm which is so pivoted that the end near the pivot close the orifice of the main when the ball is raised to the required height of water in the tank and opens the ain as soon as ball drops with the fall of water level as it is drawn off through distribution. The ball valve shall be fixed to the tank in such a position that the body of the ball valve submerge when the tank is full upto water line. The ball valve shall be so adjusted as to limit the level of the water in the tank below the lip of the overflowpipe, and above the maximum water filled shall be as per the standard norms for GI water tank.

12.2.13.1 Water reservoirs made of concrete or masonry shall be governed by the specification in the relevant chapter. It shall have, inlet, outlet, overflow and wash out with plug and a top MS/CI cover as per schedule of items and drawings.

12.3 Drainage and Sanitation (Internal)

12.3.1 SCOPE

This scope covers the layout and construction of drains for waste water, surface water and sewage together with all fittings and fixtures inclusive of ancillary works, such as connections, manholes and inspection chambers used within and around the building and the connection to a public sewer upto treatment work, septic tank and soak pit. All sewage and drainage works shall be executed in accordance with specifications given for different works. All sewerage and drainage works shall be executed by a licensed plumbing supervisor or a licensed plumber and in accordance with 18:1742-1983 "Code of practice for Building Drainage" unless otherwise specified.

12.3.1.1 INSTALLATION :

All pipe lines, locations of fittings and fixtures, etc , shall as per drawings or as directed by the Project Consultants Correctness of lines, plumbs, orientation, symmetry and levels shall be strictly ensured. All items shall be fully secured against movement in any direction and shall be located so as to allow easy maintenance.

All pipelines, fittings and fixtures shall be installed leakproof; when the works under scope of this specification are linked up with works executed by others, the connections shall be such as to prevent any spaxhing or spilling or emission of foul odour and gasses.

12.3.2 RAINWATER DOWNCOMERS

Rainwater downcomers shall be standard cast iron or PVC pipes. Rainwater downcomers shall run along and be secured to the walls, columns, etc. Where desired by the Project Consultants these may have to be installed in chases cut in

the structure All pipes shall be well secured and supported by adequately strong brackets. The brackets may be 81 clamp type, split ring type or perforated strap iron type as approved by the Project Consultants. For vertical runs each pipe shall hang freely on its brackets fixed Just below the socket. Suitable spacer blocks shall be provided against the vertical surface to which the pipe is fixed. Roof floor drains and yard gullies shall be installed, if required, by cutting into the structure and grouted with 1:2:4 cement concrete. All gutters shall be provided with removable gratings. All horizontal pipes shall have a minimum fall of 1 in 100.

12.3.3 SOIL AND DRAINAGE

12.3.4 GRADINETS

12.3.4.1 If not specified the minimum gradients of soil and drainage pipe line shall be as follows :

100 mm nominal diameter : 1
in 150 mm nominal diameter: 1 in 65

230 mm nominal diameter: 1 in 120

300 mm nominal diameter: 1 in 200

12.3.4.2 RELATION WITH WATER SUPPLY PIPE LINES

Unless otherwise cleared by the Project Consultants, under no circumstances shall drainage and soil pipes be allowed to come close to water supply pipelines

12.3.4.3 LAYING :

Each separate pipe shall be individually set for lines and levels. Where lengths of sewer or drain pipes are laid in trench, properly painted sight rails shall be fixed across the trench at a height, equal to length of the boning rod to be used, above the required invert level of the drain or sewer at a point where; the sight is fixed. More sight rails shall be required at manholes, change of gradient and intermediate positions if the distance for sighting is more than 16 m apart. The excavation shall be boned rod shall be set on a block of wood of the exact thickness of the wall of the pipe. Each pipe shall be separately and accurately boned between sight rails.

12.3.4.4 SUPPORT AND PROTECTION ON PIPELINES

All pipes shall be laid with sockets leading uphill. Preferably the pipe shall rest on solid and even foundations for full length of the barrel. However, the pipe manufacturer's instruction as approved by the Project Consultants shall be followed in the matter of support and joints.

Where pipes are not bedded on concrete, the bed shall be left slightly high and carefully placed so that the pipe barrels rest on undisturbed ground. If anywhere the excavation has been carried too low packing shall be done in concrete. Where laid on rock or very hard ground which cannot be easily excavated to a smooth surface, the pipes shall be laid on a cradle of sand or gravel as directed by the Project Consultants. PVC or similar pipes shall be laid directly on stable soil and packed with selected soil.

The minimum support and protection for glazed stoneware pipes shall be as follows:

a. When cover is less than 1 meter and where pipes are unavoidably exposed above ground surface, the pipes shall be completely encased surrounded with concrete as per 18:41271983.

b. Where pipes are laid on soft soil with the maximum water table laying at the invert of the pipes, the sewer shall be bedded on concrete 1:4:8 mix with 20mm down aggregates as per 18:4127-1983.

c. Where the pipes have to be laid on soft soil with the maximum water table rising above the invert of the pipe, but below the top of the barrel, the pipe sewer shall be haunched with concrete 1:4:8 mix with 20mm down aggregates as per 18:4127-1983.

d. Where maximum water table is likely to rise above the top of the barrel the pipe sewers shall be completely encased/surrounded with 1:4:8 with 20mm down aggregates as per 18:4127-1983.

Vitrified clay pipes shall be laid on a bed of 150mm thick cement concrete (1:3:6) nominal mix by volume.

Cast iron pipes may be supported on suitable concrete or brick support, where specified. The support shall be unyielding and strong enough. At least one support shall be located close to ends Spacing of intermediate supports shall be as directed by the Project Consultants. Pipes shall be secured to the supports by approved means.

Anchoring of pipes where necessary shall be achieved by suitable concrete encasing designed for the expected thrust.

12.3.4.5 ENTRY INTO STRUCTURES :

For entry of the pipes lines into any building or structure suitable conduits under the structure or sleeves shall be used. The conduits and sleeves shall be such as to allow easy repairs and replacement of the pipes. Where openings or chases are required to be made in the structure for entry of pipe lines, locations and sizes shall be marked and checked by the Project Consultants. After laying of the pipeline, the openings and chases shall be mended.

12.3.4.6 TRAPS AND VENTILATING PIPES :

a. Pipes carrying the sewage from water closets and waste. water and overflow water from baths, wash basins, sinks shall be trapped immediately beneath such fixtures. Traps shall have such ventilation is necessary to maintain water seal of the trap. Ventilating pipes shall be carried up vertically from the drain to a height of at least 600 mm above the outer covering of the roof top of the building or as shown on drawings All vertic8! ventilating, anti-siphonage and similar pipe shall be covered on top with a cowl. The cowl shall be made of C I. unless desired otherwise by the Project Consultants.

Connecting to existing sewer lines shall be through a manhole

b. ***Sand cast iron spigot and socket pipe and fittings***

All soil waste and vent pipes and fittings used in the work shall be cast iron and shall conform to IS: 1729-1979 The pipes shall have spigot and socket ends,

with bead on spigot end and shall be with or without ears The pipes shall be free from cracks and other flaws. The interior of the pipes and fittings shall be clean and smooth and painted inside and outside with Or Angus Smith's solution or other approved anticorrosive paint Fittings shall include bends, offsets, branches of various types. junctions, etc., as required for the work which shall be provided according to drawings and directions of the Project Consultants.

The fittings shall be provided with access doors where so specified or directed by the Project Consultants. The access door fittings shall be of proper design so as not 10 form cavities in which the filth may accumulate. Doors shall be provided with 3 mm thick rubber insertion packing, and when closed and bolted they shall be water tight. The access doors shall have MS studs and bolts or screws or bolts and nuts.

Fixing

The pipes and fittings shall be fixed to wall by means of GI clamp of approved type and steel bolts or pipe nails, bobbins etc. as the case may be, keeping the pipe clear from the finished surface of the wall. The holder bat nails shall be fixed to the wall in wooden block. The soil pipe shall be supported at the foot upon a bed of cement concrete of proportion 1:3:6 and firmly attached to the wall.

The pipes shall be laid truly vertically or along the line as shown in the drawing. Connection between main pipe and branch pipe shall be made by using branches and bends with access door for cleaning.

All vertical soil waste, ventilating and anti-sophonage pipes shall be carried up above the roof and provided with suitable C.I. cowl on top.

Pipes outside the building shall be laid underground for which trenches shall be excavated as required for the work. The trenches shall be back filled with excavated material after the drainage system has been tested and passed.

JOINTING (LEAD CAULKED JOINT)

Unless otherwise specified, the pipes and fittings shall be jointed with lead joints as described below :-

The annual space between the socket and spigot will be first well packed in with tarred gasket or hemp yarn leaving 25 mm from the lip of the socket for the lead. The joint may be leaded by using proper leading rings or if they are not available by wrapping a ring of hemp rope covered with clay round the pipe at the end of the socket, leaving a hole through which lead shall be poured in (for pipes with sockets facing a upwards 15 mm high small clay band on socket edge may be used).

The lead shall be rendered thoroughly fluid and each joint filled in one pouring. Before caulking, the projecting lead shall be removed by flat chisels and then the joint caulked round with proper caulking tools and a hammer of 2 to 3 pounds in weight in such a manner as to make the joint quite sound. After being well set up the joint is to be left flush neat and even with the socket.

Lead for caulking shall conform to IS : 782-1978.

PAINTING :

All exposed CI pipes and fittings shall be painted to match the colour of the surroundings. The surface of the pipes and fittings to be painted shall be cleaned thoroughly and painted 2 coats with approved paint over and including

1 coat of approved primer. Pipes laid underground shall be painted with 2 coats of anti-corrosive paint.

12.3.4.7 CUTTING OF PIPES

Manufacturer's instructions shall be followed for cutting of pipes where necessary. Suitable and approved tools shall be used for the cutting so as to leave clean and square to the axis of the pipe.

12.3.4.8 JOINTING

Jointing of laid pipes shall be so planned as to avoid completely any movement or strain to the joints already made. If any joint suspected to be damaged it shall be opened out and redone.

All joints between pipes, pipes and fittings and manholes shall be gas tight when above ground and watertight when underground. Method of jointing shall be as per instructions of the manufacturer and as approved by the Project Consultants. However, in the absence of any instruction available from the manufacturer the methods as detailed hereunder shall be used.

a. SAND CAST IRON PIPES

Jointing of cast iron pipe shall be done as described in Sl.No.12.3.4.7 (b)

b. CONCRETE PIPES

i. *Spigot & Socket joint*

The opening of the joint shall be filled with stiff mixture of cement mortar 1:2 (1 cement : 2 fine sand) which shall be rammed with caulking tool.

ii. *Collar joint*

Joint shall be done by slipping the collar over and clear of the end of the pipe. The recess at the end of the pipe shall be filled with jute braiding dipped in hot bitumen. Care shall be taken that no off-set of the jute braiding shall be visible either outside or inside the pipe. The collar shall be then set up over the joint covering equally both the pipes and leaving an even caulking space all round. Cement and sand mortar (1: 1.5) shall then be well punched or pressed home with a caulking tool.

c. *Glazed stoneware pipes*

Tarred gasket or hemp yam soaked in thick cement slurry shall first be placed round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and the gasket caulked tightly so as not to fill more than ¼ of the socket. The remainder of the socket shall be filled with a stiff mixture of cement mortar of 1: 1 proportion. When the socket is filled, a fillet shall be formed round the joint with a trowel, forming an angle of 45 degree with the barrel of the pipe. The newly made joints shall be protected, until set, from sun and rain and shall be covered with damp sacking or other suitable materials.

12.3.5 TRENCHES AND OTHER EXCAVATIONS

Excavation shall be carried out according to Chapter -2, Earthwork.

Width of the trench at the bottom shall be stacked sufficiently away from the edge of the trench. The soil bank shall not be allowed to endanger the stability of the

excavation. Soil may be carted away and used for filling the trench behind the work. Turf, top soil or other surface material shall be set aside, turf being carefully rolled and stacked for use in reinstatement. All excavations shall be properly timbered, where necessary. Efficient arrangements for dewatering during excavation and keeping it dry till back filling shall be made to the satisfaction of the Project Consultants. Sumps for dewatering shall be located away from the pipe layout.

Where the excavation proceeds through roads, necessary permission shall be secured by the Contractor from the appropriate authorities.

Special care shall be taken not to damage underground service cables etc. These when exposed shall be kept adequately supported the trench is backfilled. The backfilling shall be done after pipeline has been tested and approved by the Project Consultants. Special care shall be taken for packing with selected material in areas '300mm around the pipe. Atleast 300mm over the pipe shall also be filled with soft earth or sand.

Consolidation shall be done in 150mm layers. The surface water shall be prevented from getting into the filled up trench. Traffic shall not be inconvenienced by heaping up unduly the backfilling material to compensate future settlement. All settlements shall be made good regularly to minimize inconvenience or traffic where applicable.

12.3.6 INSTALLATION OF FITTINGS & FIXTURES

12.3.6.1 GENERAL

All fittings & fixtures shall be laid out as per drawings and in proper line, level and shall be firmly secured to floors with screws. Unless otherwise specified only C.P.Brass screws shall be used for fixing sanitary fittings to wall plugs and floor.

12.3.6.2 INDIAN PATTERN WC

The water closet pan shall be sunk into the floor and embedded in cushion of average 150mm cement concrete 1:4:8 (1 cement, 4 sand and 8 broken brick ballast of 40mm size). The concrete shall be left about 125 mm below the top level of the pan so as to allow for flooring and its bed concrete. The joint between the pan and trap shall be made with C.M 1:1 and joint between trap and CI soil and waste pipe to be made with lead. All the joints shall be leak proof. The WC floor shall slope towards the pan. The foot rest shall be set in cement mortar 1:3 (1 cement: 3 sand).

The cast iron cistern, brackets and flush pipe etc., shall be painted with two coats of approved paint, over and including a coat of approved priming.

12.3.6.3 WASH BASIN

Wash basin shall be fixed to C.I./R.S. brackets fixed in cement mortar 1:3 (1 cement3 sand). The brackets shall be fixed to approved wooden wall plugs with screws. C.P.brass trap and union shall be connected to waste pipe if specified.

12.3.6.4 URINALS

The urinal shall be fixed to the walls C.P. Brass screws fixed to wooden plugs. Urinal partitions shall be fixed to walls by making chases in walls and grouting the same in 1 :2:4 cement concrete.

12.3.6.5 MIRROR

Fixed type mirror shall be screwed to wall plugs with CP brass and shall have backing of asbestos cement sheet or similar material as specified in the item.

12.3.6.6 GULLY TRAP

This shall be fixed on 100 mm thick bed and encasement of size 600mm x 600mm x full height of trap shall be provided with cement concrete of Proportion 1:4:8 with 40mm stone aggregate. The gully outlet shall be jointed to the branch drain as specified or directed by the Project Consultants.

12.3.6.7 MASONRY CHAMBER FOR GULLY TRAP

After fixing and testing gully and branch drain, a brick masonry chamber 300mm x 300mm x 450mm deep or as specified (internal dimensions) in cement mortar 1:4 (1 cement and 4 sand) shall be built with half brick thick wall round the gully trap from the top of the concrete. The internal faces of the chamber shall be finished smooth with 15mm thick cement plaster (1:4) and neat cement finish with 12mm thick cement wall exposed to outside shall be finished with 12mm thick cement plaster 1:4 P.C.C (1:2:4) band 100mm thick shall be provided over the brick work with suitable grooves for accommodating R.CC. cover to be supplied as per drawing and made water tight by providing suitable beading in the band.

12.3.7 SEPTIC TANK AND EFFLUENT DISPOSAL

12.3.7.1 SEPTIC TANK

Septic Tank shall consist of the tank itself with inlet and outlet there from complete with all necessary earthwork and backfilling. The details of septic tank shall be as shown on drawing. This item shall also include ventilating pipe of atleast 100 mm dia, whose top shall be provided with a suitable mosquito proof wire mesh and cowl. Generally ventilating pipe shall extend to a height of about 2 meters when the septic tank is atleast 15 meters away from the nearest building and to a height of 2 meters above the top of building when it is located closer than 15 meters. Ventilating pipes can be connected to the normal soil ventilating system of the building where allowed.

12.3.7.2 EFFLUENT DISPOSAL

The effluent from the septic tank shall be disposed by allowing it into an open channel or a body of water if the concerned authority approves or into a soak pit for absorption by soil or shall be allowed to be absorbed by soil through open jointed S.W .pipes laid in a trench filled with broken bricks.

12.3.7.3 SOAK PIT

Shall be complete as shown on drawing. In absence of a detailed drawing it shall consist of a 900 mm dia pit 1000 mm in depth below the invert level of the inlet pipe. The pit shall be lined with stone, brick or concrete blocks with open joints backed with at least 75 mm of clean coarse aggregate. The lining above the inlet level shall be set in cement mortar (1:6). The pit shall be filled with brick bats. Inlet pipe shall be taken down to a depth of 900 mm from the top as an anti- mosquito measure.

12.3.7.4 OPEN JOINT S.W.PIPES

Minimum dia of the S.W.PIPES shall be 200 mm nominal. The trench for laying the pipes shall be minimum 600x600 mm. The joints of the pipes shall be left unsealed.

12.3.7.5 COMMISSIONING SEPTIC TANK

After the septic tank has proved water-tight and the sewage system is checked, the tank shall be filled with water to its outlet level before the sewage is let into the tank. It shall be seeded with well digested sludge obtained from septic tank or sludge tank or sludge digestion tank. In the absence of digested sludge a small quantity of decaying organic matter such as digested cow dung may be introduced.

12.3.8 MANHOLE/INSPECTION CHAMBERS

Necessary excavation as required for the manhole shall be done true to dimensions and levels as shown in the drawing. The manhole chamber shall be built with brick work in C.M. 1:4 with minimum one brick thick on a base of 100mm thick cement concrete 1:4:4 with 40mm down aggregate or as specified. The concrete bed shall extend beyond the external face of brick work on all sides by at least 75mm. The thickness of wall shall be as indicated. The work shall be carefully built in English bond, the jointing faces of each brick being wall buttered with cement mortar before laying so as ensure a full joint.

The inside of the walls shall be plastered with 15mm thick cement mortar 1:4 and finished with a floating coat of neat cement and outside shall be plastered with 12mm thick C.M.1:4.

The channels and benching shall be done in cement concrete 1:2:4 with 20mm down stone aggregate and finished with 12mm thick cement plaster in C.M.1:3. the channels shall be semicircular in the bottom half and of diameter equal to sewer. Above the horizontal diameter the top edge shall be suitably rounded off. The Branch channels shall also be similarly constructed with respect to benching but at their junction with the main channel an appropriate fall suitably rounded off in the direction of flow of the main channel shall be given. The benching at the sides shall be carried up in a *slope of* 1 *in* 3. All angles shall be rounded to 75mm radius with cement mortar 1:4 and shall be rendered smooth. The internal surfaces shall have a hard impervious finish obtained by using a steel trowel. The manhole chamber shall be covered on top with RCC (1:2:4) slab with necessary reinforcement as per drawings. Unless otherwise specified circular type light duty M.H. cover with single seal weighing 25 kg will be provided in each RCC cover.

12.3.9 TESTING AND ACCEPTANCE

12.3.9.1 INSPECTION BEFORE INSTALLATION

All pipes, fittings and fixtures shall be inspected, before delivery at the site to see whether they conform to accepted standards. The pipes shall again be inspected on site before laying by sounding to disclose cracks. All defective items shall be clearly marked and forthwith removed from the site.

12.3.9.2 TESTING OF PIPELINES

Comprehensive tests of all pipe lines shall be made by stimulating conditions of use. The methods of actual test shall be decided by the Project Consultants. All test data shall be recorded and submitted to the Project Consultants for review and instruction. The Project Consultant's discretion regarding tolerance shall be final.

General guidance for the tests are given below:

12.3.9.3 SMOKE TEST

Soil, waste, vent and all other pipes, when above ground, shall be tested for gas tightness by a smoke test conducted under a pressure of 25mm water gauge and maintained for 15 minutes after all trap seals have been filled with water. The smoke is produced by burning oily waste or tar paper or similar material in the combustion chamber of a smoke machine. Chemical smokes are not satisfactory.

12.3.9.4 WATER TEST

FOR PIPES OTHER THAN CAST IRON

Glazed ware and concrete pipes shall be subjected to a test pressure at least 1.5 m head of water at the highest point of the section under tests. The tolerance figure of two litres per centimeter of diameter per kilometer may be allowed during a period of 10 (ten) minutes. The test shall be carried out by suitably plugging the low end of the drain and the end of connections, if any, and filling the system with water. A knuckle bend shall be temporarily jointed in at the top end and a sufficient length of the vertical pipe jointed to it so as to provide the required test head or the top end may be plugged with a connection to a hose ending in funnel which could be raised or lowered till the required head is obtained and fixed suitably for observation.

Subsidence of test may be due to one or more of the following causes :-

a. Absorption by pipes and joints.

b. Sweating of pipes or joints.

c. Leakage at joints of from defective pipes

d. Trapped air.

Allowance shall be made for (a) by adding water until absorption has ceased and after which the test proper should commence. Any leakage and the defective part of the work shall be cut and made good.

12.3.9.5 FOR CAST IRON PIPES

Cast Iron sewers and drains shall be tested as for glazed ware and concrete pipes. The drain plug shall be suitably strutted to prevent their being forced out of the pipe during the test.

12.3.9.5.1 FOR STRAIGHTNESS

i. By inserting at he high end of the sewer or drain a smooth ball of a diameter 13 mm less than the pipe bore. In the absence of obstruction, such as yarn or mortar projecting through the joints, the ball will roll down the invert of the pipe and emerge at the lower end and;

ii. By means of a mirror at one end of the line and lamp at the other. If the pipe line is straight, the full circle of light may be observed. The mirror will also indicate obstruction in the barrel if the pipeline is not straight.

12.3.9.6 TESTING SEPTIC TANK

The septic tank shall be tested for water tightness. It shall be filled up with water and allowed to soak for 24 hours. Then, it shall be topped up and allowed to stand again

for 24 hours and loss of level recorded. The fall shall not be more than 15mm.

12.3.9.7 FIXTURES ETC.

All fixtures and fittings shall be connected by water tight joints No dripping shall be accepted.

13. EXTERNAL SEWERAGE & DRAINAGE

13.1 SCOPE OF WORK

The work comprises supply, laying, testing, commissioning etc., of sewerage & drainage network as specified.

The work includes the following activities connected with the job.

i. Supply and delivery of all required pipes and other materials including erection,

ii. Earthwork in excavation for trenches and pits/manholes.

iii. Civil works connected with the laying / erection of pipe lines such as making holes in the walls, etc., and repairing them after pipe erection, construction of pipe supports, brick/concrete manholes, preparation of concrete bedding and covering for pipe laying required etc.

iv. Laying and jointing of the pipelined as specified in this chapter.

v. Testing of the pipelines after laying as per standard tests as specified in this chapter.

vi. Back filling of the trenches after successful and satisfactory completion of tests for the pipeline laid.

vii. Cleaning, painting/coating and wrapping etc. of pipes and

fittings etc, viii.Commissioning of entire network laid.

ix. Safe custody of pipes/material/equipment/work and other obligations stated elsewhere in the specification.

x. Any other activities which are not mentioned above but essential and required.

xi. If specified, at road crossing the pipe shall be laid in encasing pipes, wrapped & coated

M.S. Pipes shall be used as encasing pipes. The encasing pipe shall project beyond the berm or both sides of the road. The encasing pipe shall be supported on P.C.C. saddles if the site condition warrants so.

13.2 MATERIALS

The materials shall conform to Part - I of this series. Sewerage network in Township shall generally be of R.C.C. /S.W.G. pipes, R.C.C. pipes being used normally for pipe sizes of 400mm dia and above. In plant area, at road crossings etc. cast iron pipes may be used

13.3 EXCAVATION OF TRENCHES AND PITS

Excavation shall be carried out according to Chapter of Earthwork.

Before starting earthwork in excavation, temporary drainage arrangement shall be provided to prevent surface water entering the trenches and pits at the cost of Contractor.

Excavation of trenches and pits for pipelines shall be carried out in shortest possible time so as to avoid sinking of ground and consequent damage to the pipelines.

Excavation of trenches for pipelines and surface drains, shall be in exact accordance with the plans and section, alignment, levels and gradients as indicated on the drawings or as directed at site by the Project Consultants. The final bed must be dressed, levelled or trimmed to proper gradient and rammed with sprinkling of sand and got passed by the Project Consultants. No excavation shall be made below the specified levels without written permission of the Project Consultants. Should any excavation be taken below the specified level due to carelessness of the Contractor, he will fill in such excavation at his own expense as specified in clause 2.12.

13.4 CAST IRON PIPES

13.5 STONEWARE GLAZED PIPELINES (S W G)

13.5.1 BACKFILLING

Trenches shall not be back filled until the pipe joints have been tested, alignment and gradient passed by the Project Consultants, but back filling shall be done at least for a depth equal to the diameter of the pipe or 300 mm whichever is greater over the pipes leaving 450mm on either side of the joints uncovered with earth till the testing is completed. These joints should however be kept covered with mats, gunny bags, straws etc., to avoid damage to joints by temperature effects.

While back filling care should be taken to ensure that no damage is done to the pipelines, The first 300 mm of filling material immediately over and around the pipe should be of soft material free from clods and stones etc, The remainder of the filling material shall be watered and rammed in layers not exceeding 250 mm at a time,

Paving and metalling shall be reinstated in as good order as before laying of the pipeline.

Unless otherwise required by the Project Consultants, there shall be a minimum cover of 700 mm over the pipes and at road crossing etc,, it shall not be less than 900 mm.

13.5.2 LAYING OF PIPES

The laying of the pipelines shall commence only after the levels of the bottom of the trench at various points have been checked by the Project Consultants, Cracked pipes whether at the socket or In the body shall be rejected, All SW pipes shall be fitted together on the surface of the ground to ensure a proper fir before they are lowered. The spigots and sockets shall be properly cleaned and brushed, if necessary & then lowered by hand to the bottom of the trench.

The pipes shall be carefully laid to the alignment, levels and gradients shown on the plans and sections, and great care shall be taken to prevent sand, earth or other matter from entering the pipes during laying As it is not permitted to rectify errors of grade by packing up underneath with earth, care should be taken in excavating and slight scraping, if necessary, done to bring to grade. The pipes between manholes shall be laid truly in straight lines without vertical or horizontal undulations,

Bedding, hunching or encasing of the pipes during laying shall be in accordance with 1S:4127- 1983 and shall be done with cement concrete in proportion (1:4:8) to prevent ground water from entering the pipelines,

All inverts shall be laid from the site rail fixed at the true levels, with proper boning rod. The sight rails and boning rods shall be provided, fixed and maintained by the Contractor at his own expense.

The pipelines shall be laid, sockets facing up the gradient, beginning at the lower end, and with the sockets, resting in the socket rest hole cut in the trench bottom. Each pipe shall be laid singly and no pipe shall be laid until the trench has been excavated to its required depth to a distance of twenty yards in front of the pipes to be laid. No pipes of any description shall be covered until they have been passed by the Project Consultants.

13.5.3 JOINTING OF PIPES

a. CEMENT JOINT

The stoneware pipes shall be cement jointed normally. In case, if specified so, bituminous joints shall be used. In each joint, spun yarn soaked in neat cement slurry or gasket of tarred yarn shall be passed round the joint and inserted in it by means of suitable jointing tools. More skeins of spun yarn or gasket shall then be added and well rammed home. The yarn shall be moistened to avoid absorbing moisture from cement mortar.

The yarn should be so placed as to centre the spigot of one pipe within the socket of the other and shall prevent the jointing, mortar penetrating inside the pipe where it might set and interfere with the flow of sewage.

Yarn or gasket (cemented or tarred) so rammed shall not occupy more than one-fourth of the depth of socket.

The cement shall be thoroughly mixed with medium sand in the proportion of 1:1 (1 cement: 1 sand) and then just enough water shall be added to make the mix plastic On no account, the mortar shall be made soft or sloppy; the mix shall then be carefully inserted by hand into the joint.

Special care shall be taken for inserting the mortar into the portion of the joint underneath the pipe. When the cement, mortar has been inserted, it shall be punched or caulked into the joint with wooden caulking tools, and more cement mortar shall be added until the space of the joint has been filled completely with tightly caulked cement. No fillet of cement shall be added.

No mortar, which is older than 30 minutes, shall be permitted for jointing. The cement mortar joints shall be cured at least for seven days before testing.

The inside of each pipe shall be carefully wiped out with a mop or scrapper sufficiently long to pass two joints from the end of the pipe and any projecting cement shall be removed.

All pipes entering the manholes should be set in cement mortar 1:3 and a completely watertight effected.

b. BITUMINOUS OF PIPES

If specified so this joint will be used. Asphalt and sand in the ratio of 1:7 shall be boiled together and filled into the socket in a molten state with the aid of special moulds.

13.5.4 TESTING OF PIPES

Testing of pipes shall be done wholly at Contractor's expense inclusive of apparatus, provision of water, etc., and/or as per IS: 4127 -1983.

After cement has had time to set, the pipes shall be tested in lengths between manholes in the following 'manner'. In the lowest manhole a plug shall be inserted in the pipe. The disc in the pipe and at the upper manhole shall be fitted with a filling pipe with a right angle bend and an air cock. The length of pipe shall then be filled with water by means of the pipe connection on the upper disc. The air cock in the upper disc shall be kept open, while the pipeline is being filled to permit the escape of air.

When the pipes have been filled with water and air excluded, the air cock shall be shut and water shall be poured into a conical "Filler" attached to the testing and filling pipe of the disc in the upper manhole until water remains in the filler. The testing of filling pipe shall then be raised and fastened so that the height of the pipe is six feet, which will be the usual test pressure for stone ware pipe joints.

The test will be for an hour or such longer period as may be set by the Project Consultants. If the water level does not fall more than 25 mm in the length of 90 metre, the test may be considered satisfactory.

13.5.5 CONCRETE BEDDING, HAUNCHING & ENCASING

Unless otherwise specified in the Schedule of Quantities, all SW pipes shall be laid in accordance with IS : 4127 -1983. As per site condition hauncing or land encasing of pipes with cement concrete may be required as per clause 4.2 & 4.3 of IS : 4127-1983 The concreting shall be done with 1 A8 cement sand concrete.

Where sewers have less than 1.2 m cover at places of heavy traffic, these shall be surrounded with mass concrete if directed by the Project Consultants.

13.5.6 HANDLING OF PIPES

While unloading, pipes shall not be dropped from the trucks / carts on the ground. Timber skids and steadying rope should be used while unloading or lowering in trenches. To avoid damage specially to spigot end, pipes should not be dragged on the hard surface.

13.6 MANHOLES

All manholes shall be of the size and type as given in the Schedule and shall be provided as per drawing or as directed by the Project Consultants. All the manholes shall be circular or other shape as shown in drawing. The bed shall be in cement concrete of mark - 10B (or 1:3:6 mix) (Size of coarse aggregate 40 mm and down) of 100 mm thickness or as shown in the drawing and shall be projected out 75 mm from the outside face of the wall all round, or as shown in the drawing. The working part including channeling, benching etc., made of PCC shall be of grade - 15C (or 1:2:4 mix). All manholes shall be plastered inside with 1:3 cement plaster 20 mm thick and finished with a floating coat of neat cement unless otherwise specified.

Concrete used for precast RCC cover slabs shall be of grade 20C (or 1: 1.5:3 mix) and shall be constructed as per drawing.

The top level of manholes shall be generally 100 mm above the surrounding ground levels shall be generally 100 mm above the surrounding levels or as directed by the Project Consultants. Channeling inside the manhole shall be done in smooth bends.

The end pipe shall be neatly built in and finished in cement mortar 1:3. Circular medium duty Cast iron water sealed manhole cover and frames, 560 mm dia (clear opening) and nominal weight 128 kg shall be provided for each manhole and shall be in accordance with

IS:1726-1991. Manhole covers with double seals (Light duty) with weight as specified in the schedule of item shall be provided within compound near the buildings if specified so. If specified heavy duty cover and frames, either circular or double triangular type, shall be provided. Step irons shall be provided with two coats of bituminous paint and shall be as per drawing.

In cases, where branch pipe sewers at a level, more than 1 m, from the main sewer, a drop connection shall be provided. The extra pipe length required for this connection will be paid under item for pipelines. No other extra payment will be allowed.

All exposed surfaces of cast iron frame and cover shall be painted with two coats of bituminous painting.

13.7 MARKER PLATES

Marker plate indicating the particular service installed shall be provided along the routes of pipes laid below ground. These shall be of mild steel, with the type of service and direction of flow, painted on it. The markers shall be set firmly in a concrete base and installed at all corners and turning points. Over straight runs markers shall be spaced at 100m intervals generally.

14. WATER PROOFING

14.1 SCOPE

This chapter deals with different types of waterproofing on roof and different types of damp proofing treatment in basement.

14.2 MATERIALS

The materials shall conform to Part – I.

14.3 GENERAL WORKSHOP

The waterproofing to roofs and basement being specialized works the Contractor shall get these done by specialized firms/agencies.

14.4 SURFACE APPLICATION

Waterproofing done by surface application of epoxy/polymer based material shall conform strictly to the recommendations of the manufacturer. The work shall be carried out by a firm of specialists in the trade.

14.5 GUARANTEE

For the waterproofing on the roof as well as for underground basements the Contractor shall give guarantee in writing for the period of 7 to 10 years as specified in the Schedule of Item. For such guarantee the Contractor shall get guarantee from the manufacturer/specialized firms and forward the same to the Project Consultants. However, the Contractor shall be fully responsible for the serviceability of the waterproofing treatment throughout the guarantee period and any leakage during the guarantee period shall be stopped by the Contractor at no cost to the Owner and without working facility of the Owner.

15. MISCELLANEOUS

15.1 EXPANSION AND ISOLATION JOINTS

15.1.1 GENERAL

Expansion and isolation joints in concrete structures shall be provided at specific places as per details indicated on the drawings. The materials and types of joints shall be as specified hereinafter. In case of liquid retaining structures, additional precautions shall be taken to prevent leakage of liquids as may be specified on the drawings or as directed by the Project Consultants. All materials are to be procured from reliable manufacturers and must have the approval of the Project Consultants.

Where it is the responsibility of the Contractor to supply the material, the Project Consultants may demand test certificates for the materials and/or instruct the Contractor to get them tested in an approved laboratory free of cost to the Owner. Joints shall be formed true to line, level, shape, dimension and quality as perdrawings and specifications. Prior approval, for the method of forming the joints, should be obtained from the Project Consultants before starting the work.

15.1.2 BITUMEN IMPREGNATED BOARD

Bitumen impregnated fibre board of approved manufacturer as per IS: 1838 (Part - I) 1983 may be used as fillers for expansion joints. It must be durable and waterproof. It shall be compressible and possess a high degree of rebound. The dimensions of the board should be equal to that of the joint formed. At the exposed end, the joint shall be sealed with approved sealing compound to a depth of at least 25 mm after application of an approved primer. The sealing compound and the primer shall be applied as specified by the manufacturer.

15.2 BARBED WIRE FENCING

15.2.1 MATERIALS

15.2.1.1 GALVANISED BARBED WIRE

Barbed wire shall be properly galvanized and shall be obtained from the approved manufacturer as specified in detail in Part - I.

15.2.1.2 OTHER MATERIALS

The specifications of materials, for angle iron posts, concrete works, plasters, if any, and for other works, shall conform to the requirements as specified in Part - I.

15.2.2 WORKMANSHIP

The work shall comprise of the following:

a. Excavation in ground of required dimensions with all slides vertical in any type of soil including soft rock removing the soil and dressing it neatly.

b. Filling the holes in full with cement concrete 1:3:6 mix, well packed, after erecting the posts in correct line, level and plumb, in case of any post coming depression, the hole may not be of full depth but the depth of concrete will always be made 60 cm raising it ground level with necessary shuttering.

c. Where the angle iron posts are specified in the item these shall be 50 mm x 75 mm x 6 mm unless otherwise. 1 0 mm dia holes with saw cuts for inserting the wires shall be made as per the spacings of barbed wire shown in drawing or as directed by the Project Consultants. The foot of the post shall be provided with base plate for anchorage. The spacing shall be 2.5 m or as per drawing. After inserting the wire into holes the socket is to be pressed back.

d. Straining bolts are to be provided 15 m apart from each row of wire for maintaining proper tension in the wire and without any sag or looseness.

e. Posts are to be appointed as directed by the Project Consultants.

SPECIFICATION FOR CIVIL WORKS

PART – III

NORMS OF CEMENT CONSUMPTION

CONTENTS :

1. MASONRY WORK

2. PLAIN/REINFORCED CONCRET WORK

3. FINISHING WORK

4. FLOORING WORK

5. MISCELLANEOUS ITEMS

6. WATER SUPPLY/DRAINAGE & SANITARY WORKS

GENERAL

For calculating the requirements of cement in various items of work the following standards shall be adopted. Over the above theoretical quantity of cement, additional allowance upto plus or minus 3% shall also be allowed as certified by the Project Consultants.

For items not covered in this standard, PWD standards shall be followed or calculated as per uses/requirement in absence of standard norms. Cement required for enabling work and cement required for testing purposes will be taken into account for consumption purpose. However, in no case such quantity should exceed 5 % of the total cement used in the work or as certified by the Project Consultants based on actual observation whichever is less.

Sl No.	Description of Item		Cement Requirement
MASONRY WORK			
1	Random rubble masonry with	CM 1:4	1.255 quintals per cum
2	Random rubble masonry with	CM 1:6	0.825 quintals per cum
3	Coursed rubble masonry in	CM 1:6	0.75 quintals per cum
4	Brick work in	CM 1:4	0.950 quintals per cum of BW
5	Brick work in	CM 1:6	0.625 quintals per cum of BW
6	Half Brick work in	CM 1:3	1.43 quintals per 10 sqm of area
7	Half Brick work in	CM 1:4	1.06 quintals per 10 sqm of area
8	75 mm thick Brick work in	CM 1:4	0.65 quintals per 10 sqm of area
9	75 mm thick Brick work in	Cm 1: 3	0.81 quintals per 10 sqm of area
10	Projected Brick bands drip course etc., in CM 1: 6 finished with 12 mm thick cement plaster		0.165 quintals per 101”6 3 RM
11	Half brick thick, honey combed brick work in	CM 1:4	0.064 quintals per sqm

PLAIN/REINFORCED CONCRETE

1.	RCC/PCC of nominal mix 1 : 5 : 10 complete (excluding finishing with CP)	1.30	Quintals per cum of concrete
2.	RCC/PCC of nominal mix 1:4:8 complete (excluding finishing with CP)	1.70	Quintals per cum of concrete
3.	RCC/PCC of nominal mix 1:3:6 complete (excluding finishing with CP)	2.23	Quintals per cum of concrete
4.	RCC/PCC of nominal mix 1:2:4 complete (excluding finishing with CP)	3.18	Quintals per cum of concrete
5.	RCC/PCC of nominal mix 1:1.5:3 complete (excluding finishing with CP)	4.00	Quintals per cum of concrete
6.	RCC/PCC of nominal mix 1:1:2 complete (excluding finishing with CP)	6.10	Quintals per cum of concrete

CONTROLLED CONRCETE – PLAIN AND REINFORCED

7.	Concrete grade	a. M-5A b. M-5BI c. M-7.5A d. M-7.5B	To be mutually agreed base don volumetric mix to be prepared by the contractor and approved by the Project Consultants
8.	Concrete grade	a. M-10 A b. M-10 B c. M-10 C	
9.	Concrete grade	a. M-15 B b. M-15 C c. M-15 D	
10.	Concrete grade	a. M-20 B b. M-20 C c. M-20 D	
11.	Concrete grade	a. M-25 B b. M-25 C c. M-25 D	To be mutually agreed based on mix design to be prepared by contractor and approved by the Project Consultants plus wastage and all incidentals as decided.
12.	Concrete grade	a. M-30 C b. M-30 D	
13.	Applying cement slurry on RCC slab for receiving cement concrete flooring	-	2.75 kg/sqm.

FINISHING:

1	6mm thick C.P. 1:4	0.280 quintal per	10 sqm area
2	10mm thick C.P. 1:5	0.370 quintal per	10 sqm area
3	10mm thick C.P. 1:4	0.430 quintal per	10 sqm area
4	10mm thick C.P. 1:6	0.300 quintal per	10 sqm area
5	12mm thick C.P. 1:3	0.734 quintal per	10 sqm area
6	12mm thick C.P. 1:4	0.547 quintal per	10 sqm area
7	12mm thick C.P. 1:4	0.360 quintal per	10 sqm area
8	15mm thick C.P. 1:4	0.655 quintal per	10 sqm area
9	15mm thick C.P. 1:4	0.440 quintal per	10 sqm area
10	20mm thick C.P. 1:4	0.850 quintal per	10 sqm area
11	20mm thick C.P. 1:4	0.560 quintal per	10 sqm area
12	12mm thick plaster in CM 1:4 with neat cement finish	0.590 quintal per	10 sqm area
13	Neat cement punning	0.200 quintal per	10 sqm area
14	Flush and cut pointing on brick work with CM 1:3	0.235 quintal per	10 sqm area
15	Raised and cut pointing on brick work with CM 1:3	0.235 quintal per	10 sqm area
16	Flush or ruled pointing on brick flooring with CM 1:4	0.075 quintal per	10 sqm area
17	Flush or ruled pointing on brick flooring with CM 1:6	0.050 quintal per	10 sqm area

FLOORING

1	Brick on edge flooring in cement mortar 1:4	1.100 quintal per	10 sqm area
2	Brick on edge flooring in cement mortar 1:6	0.800 quintal per	10 sqm area
3	25 mm thick (IPS) cement concrete flooring 1:2:4 (1 cement : 2 and : 4 grade stone chips 12 mm nominal size) finished with a floating coat of neat cement	1.020 quintal per	10 sqm area
4	40 mm thick (IPS) cement concrete flooring 1:2:4 with 20 mm and down stone chips finished with a floating coat of neat cement	1.500 quintal per	10 sqm area
5	25 mm thick (IPS) flooring with base coat 19 mm thick 1:2:4 using stone chips 10 mm nominal size and 6 mm topping coat 1:1 (1 cement : 1 stone chips 3 mm size) with a floating coat of neat cement.	1.370 quintal per	10 sqm area
6	40 mm thick (IPS) flooring with base coat 30 mm thick 1:2:4 using stone chips 10 mm nominal size and 10 mm topping coat 1:1(1 cement : 1 stone chips 3 to 6 mm size) with a floating coat of neat cement.	2.320 quintal per	10 sqm area

7	25 mm thick cast-in-situ grey terrazzo flooring under layer 19mm thick cement concrete 1:2:4 with 10 mm nominal size chips and 6 mm thick topping laid in cement marble powder by weight in proportion of 4:7 (4 cement marble power mix : 7 marble chips) by volume	1.370 quintal per	10 sqm area
8	40 mm thick cast-in-situ grey terrazzo flooring, under layer 30mm thick cement concrete 1:2:4 with 10 mm nominal size chips and 10 mm thick topping laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 4:7 (4 cement marble power mix : 7 marble chips) by volume	1.575 quintal per	10 sqm area
9	40 mm thick cast-in-situ grey terrazzo flooring, under layer 31 mm thick cement concrete 1:2:4 with 10 mm nominal size chips and top layer 9 mm thick with marble chips of size 4 to 7 mm nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 4:7 (4 cement marble powder mix :7 marble chips) by volume. a. Dark or light shade pigment with grey cement b. Light shade pigment or without any pigment with white cement c. Medium shade pigment with 50% grey cement and 50% white cement.	1.583 quintal per 1.010 quintal per (grey cement) 0.580 quintal per (white cement) 1.295 quintal per (grey cement) 0.290 quintal per (white cement)	10 sqm area 10 sqm area 10 sqm area 10 sqm area 10 sqm area
10	40 mm thick cast-in-situ terrazzo flooring, under layer 28 mm thick cement concrete 1:2:4 with 10 mm nominal size chips and top layer 12 mm thick with marble chips of size 7 to 12 mm nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 2:3 (2 cement marble powder mix : 3 marble chips) by volume. a. Dark or light shade pigment with grey cement b. Light shade pigment or without any pigment with white cement c. Medium shade pigment with 50% grey cement and 50% white cement. d. White cement without any pigment	1.705 quintal per 0.895 quintal per (grey cement) 1.300 quintal per (grey cement) 0.405 quintal per (white cement) 0.895 quintal per (grey cement) 0.810 quintal per (white cement)	10 sqm area 10 sqm area 10 sqm area 10 sqm area 10 sqm area

11	Terrazzo cast-in-situ skirting and dado, top layer 6 mm thick marble chips laid in cement marble powder mix 3:1 (3cement : 1 marble powder) by weight in proportion of 4:7 (4 cement marble : 7 marble chips) by volume		
	A). 18mm thick with under layer 12 mm thick cement plaster 1:3	1.490 quintal per	10 sqm area
	i. Dark or light shade pigment with grey	1.090 quintal per (grey cement)	10 sqm area
	cement	0.400 quintal per (white cement)	10 sqm area
	ii. Light shade pigment or without any pigment with white cement	1.290 quintal per (grey cement)	10 sqm area
	iii. Medium shade pigment with 50% grey cement and 50% white cement.	0.400 quintal per (white cement)	10 sqm area
	B). 21mm thick with under layer 15 mm thick cement plaster 1:3	1.640 quintal per	10 sqm area
	i. Dark or light shade pigment with grey cement	1.230 quintal per (grey cement)	10 sqm area
	ii. Light shade pigment or without any pigment with white cement	0.400 quintal per (white cement)	10 sqm area
	iii. Medium shade pigment with 50% grey cement and 50% white cement.	1.430 quintal per (grey cement)	10 sqm area
12	Precast terrazzo tiles 20 mm thick with marble chips of sizes upto 6 mm laid in 25 mm thick bed of lime mortar, jointed with neat cement slurry mixed with pigment	0.44 quintal per (grey cement)	10 sqm area
	a. Light shade pigment or without any pigment with white cement	0.44 quintal per (white cement)	10 sqm area
	b. Medium shade pigment with 50% grey cement and 50% white cement.	0.66 quintal per (grey cement)	10 sqm area
		0.22 quintal per (white cement)	10 sqm area
	c. Dark shades using grey cement	0.88 quintal per	10 sqm area

13	Precast terrazzo tiles 20 mm thick with marble chips of sizes upto 6 mm in skirting or on walls, laid on 12 mm thick cement plaster 1:3 jointed with neat cement slurry	1.175 quintal per (grey cement) 0.22 quintal per (white cement)	
	a. Light shades using white cement	1.285 quintal per (grey cement) 0.11 quintal per (white cement)	10 sqm area
	b. Medium shade using 50% white cement and 50% grey cement.	1.395 quintal per	10 sqm area 10 sqm area
	c. Dark shades using grey cement		10 sqm area
14	White glazed tiles 5, 6 or 7 mm thick in flooring, skirting and dado on 12mm thick cement plaster 1:3 in base and jointed with white cement, slurry etc.,	0.942 quintal per (grey cement) 0.25 quintal per (white cement)	10 sqm area 10 sqm area
	Marble stone slab flooring over 20 mm thick base of lime mortar 1:1:1 (1 lime : 1 surkhi :1 sand) and jointed with white cement slurry etc.		
	a. 20 mm thick/30 mm thick / 40 mm thick	0.075 quintal per (white cement)	10 sqm area
15	Marble stone slab flooring over 20 mm thick base of cement mortar 1:4 and jointed with white cement slurry etc.,		
	a. 20 mm thick	1.275 quintal per (grey cement) 0.075 quintal per (white cement)	10 sqm area
	b. 30 mm thick	1.290 quintal per (grey cement) 0.075 quintal per (white cement)	10 sqm area
	c. 40 mm thick	1.310 quintal per (grey cement) 0.075 quintal per (white cement)	10 sqm area
16	Marble tiles 18 to 24 mm thick in riser of steps skirting, dado, walls and pillars laid on 12 mm thick cement mortar 1:3 (1 cement : 3 sand) and jointed with white cement slurry.	1.16 quintal per (grey cement) 0.075 quintal per (white cement)	10 sqm area
17	Extra for each additional thickness of 5 mm granolithic layer of 1:2:4 for flooring	0.016 quintal per	10 sqm area
18	12 mm thick cement plaster skirting, dado, riser of steps and edges of ground sink with CM 1:3 finished with a floating coat of neat cement	0.800 quintal per	10 sqm area
19	15 mm thick cement plaster skirting, dado, riser of steps and edges of ground sink with CM 1:3 finished with a floating coat of neat cement	0.995 quintal per	10 sqm area

20	19 mm thick cement plaster skirting, dado with 12 mm thick backing with CM 1:3 and 7 mm topping 1:1 (1 cement : 1 stone chips 3 mm size) finished with a floating coat of neat cement	1.35 quintal per	10 sqm area

21	25 mm thick cement plaster skirting, dado with 18 mm thick backing with CM 1:3 and 7 mm topping 1:1 (1 cement : 1 stone chips 3 mm size) finished with a floating coat of neat cement	1.85 quintal per	10 sqm area

MISCELLANEOUS :

1	Marble work fro wall lining (Veneer work) 1.9 to 2.4 cm thick cement mortar 1:3 including pointing with white cement mortar 1:2 (1 white cement : 3 marble dust)	0.715 quintal per (grey cement) 0.170 quintal per (white cement)	10 sqm area 10 sqm area
2	Marble work fro wall lining (Veneer work) 4 cm thick cement mortar 1:3 including pointing with white cement mortar 1:2 (1 white cement : 3 marble dust)	1.020 quintal per (grey cement) 0.170 quintal per (white cement)	10 sqm area 10 sqm area
3	Grading roof for water proofing treatment with :		
	a. C.C. 1:2:4 (1 white cement : 2 coarse sand : 4 stone aggregate 20 mm nominal size)	3.20 quintal per cum of mortar	
	b. CM 1:3	5.10 quintal per cum of mortar	
	c. CM 1:4	3.80 quintal per cum of mortar	
4	Providing and fixing MS Fan clamps of standard shape and size in existing RCC slab including cutting chase and making good	0.016 quintal each	
5	Making plinth protection 50 mm thick of CC 1:3:6 (1 cement : 3 coarse sand : 6 stone aggregate 20 mm nominal size) over 75 mm bed of dry brick ballast 40 mm nominal size well rammed and consolidated and grouted with fine sand including finishing the tope smooth.	1.10 quintal per	10 sqm area
	Grouting with CM 1:2	7.18 quintal per cum	
	Grouting with CM 1:3	5.40 quintal per cum	
	D P C 25 mm thick (1:2:4)	0.81 quintal per	10 sqm area
6	Making plinth protection with brick on edge in C M 1:6 over 75 mm bed of dry brick aggregate 40 mm nominal size well rammed, consolidated and grouted with fine sand and top of bricks pointed with CM 1:2	0.86 quintal per	10 sqm area
7	Providing and fixing 25 mm dia pipe outlet in CM 1:3 including cutting chase and making good the walls	0.05 quintal per	10 RM

8	Providing and fixing 40 mm dia pipe outlet in CM 1:3 including cutting chase and making good the walls	0.075 quintal per	10 RM
9	Providing Chases 75 mm wide 50 mm deep in walls for conduit pipe and filling the same with CM 1:3	0.075 quintal per	10 RM
10	Fixing steel windows with 1:2:4 concrete blocks	0.40 quintal per	10 sqm area
11	Cement Sand Mortar : a. 1:1 (1 cement : 1 sand)	10.2 quintal per cum	
	b. 1:2 (1 cement : 2 sand)	6.80 quintal per cum	
	c. 1:3 (1 cement : 3 sand)	5.10 quintal per cum	
	d. 1:4 (1 cement : 4 sand)	3.80 quintal per cum	
	e. 1:5 (1 cement : 5 sand)	3.10 quintal per cum	
	f. 1:6 (1 cement : 6 sand)	2.50 quintal per cum	

DRAINAGE/SANITARY & WATER SUPPLY INSTALLATINS:

1	100 mm dia AC rain water pipe I/C fittings with CM 1:2	0.715 quintal per	100 RM of Pipe
2	150 mm dia AC rain water pipe I/C fittings with CM 1:2	0.82 quintal per	100 RM of Pipe
3	Fixing IWC pan with traps, pair of footrests, and flushing cistern complete	0.125 quintal each	
4	Fixing EWC pan with traps and flushing cistern complete	0.01 quintal each	
5	Fixing of Wash Basin and Kitchen Sink	0.025 quintal each	
6	Fixing Urinal cistern including pipes	0.025 quintal each	
7	Fixing & Finishing Floor trap	0.015 quintal each	
8	Fixing HCI pipes and specials, 100 mm dia 75 mm dia including making good the walls.	0.135 quintal per	10 RM of pipe
9	Fixing GI Pipes of all dia with clamps (for inside work only)	0.015 quintal per	10 RM of pipe
10	Jointing glazed stoneware pipe with CM 1:1	-	
	a. 100 mm dia	2.17 quintal per	10 RM of pipe
	b. 150 mm dia	3.23 quintal per	10 RM of pipe
11	Laying cement concrete 1:5:10 all-round S W pipe including bed concrete as per standard design	0.075 quintal per	10 RM
	a. 100 mm dia	19.24 quintal per	100 RM of pipe
	b. 150 mm dia	23.53 quintal per	100 RM of pipe
12	Gully chamber as per specification	0.385 quintal each	
13	Stop cock chambers as per specification	0.185 quintal each	
14	Inspection chambers as per specification		
	a. 600 x 600 x 600 mm deep	1.43 quintal each	
	b. 750 x 600 x 600 mm deep	1.435 quintal each	
	c. 900 x 900 x 600 mm deep	1.885 quintal each	
15	Extra depth of inspection chambers as per specification		
	a. 600 x 600 mm	0.805 quintal per	RM of pipe
	b. 750 x 600 mm	1.295 quintal each	RM of pipe
	c. 900 x 900 mm	1.460 quintal each	RM of pipe
	d. 1200 x 900 mm	1.835 quintal per	RM of pipe

SECTION 8 – DRAWINGS

Attached separately

SECTION 9 – BILL OF QUANTITIES

Sl. No.	Description of item (with brief specification and reference to Book of specification	Quantity	Unit	Rate (Rs)		Amount (Rs)
				In figures	In words	
As Generated on Karnataka Public Procurement Portal						
Total Tender Price (in figures)						
(in words)						

Note :

(1) Item for which no rate or price has been entered in will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities (refer : ITB Clause 11.2 and CC Clause 37.2).
(2) Unit rates and prices shall be quoted by the Tenderer in Indian Rupees.
(3) Where there is a discrepancy between the rate in figures and words, the unit rate as quoted will govern. [ITT Clause 24.1(a)]
(4) Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by quantity, the unit rate quoted shall govern [ITT Clause 24.1 (b)]

SECTION 10 – FORMAT OF BANK GUARANTEE FOR SECURITY DEPOSIT

To :_____[*name of Employer*]
_____[*address of Employer*]

WHEREAS_____[*name and address of Contractor*] (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No._____dated_____to execute _____[*name of Contract and brief description of Works*] (hereinafter called "the Contract");

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of Rs._____[*amount of guarantee*] Rupees _____[*in words*], and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of _____[*amount of guarantee*]as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until 30 days from the date of expiry of the Defects Liability Period.

Signature and seal of the guarantor _____
Name of Bank _____
Address _____
Date _____

SECTION 11 : FORMAT OF BANK GUARANTEE FOR EARNEST MONEY DEPOSIT

WHEREAS_____*[name of Bidder]* (hereinafter called "the Bidder") has submitted his bid dated_____*[date]* for the work of_____*[name of Contract]* (hereinafter called "the Bid").

KNOWN ALL MEN by these presents that We_____*[name of bank]* of _____ *[Name of Country]* having our registered office at _____ (hereinafter called "the Bank") are bound unto_____*[Name of the Employer]* (hereinafter called "the Employer") in the sum of_____for which payment well and truly to be made to the said Employer the Bank binds himself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this_____day of_____20__.

THE CONDITIONS of the obligation are:

1. If the Bidder withdraws his Bid during the period of bid validity specified in the Form of Bid;
2. If the Bidder having been notified of the acceptance of his Bid by the Employer during the period of Bid validity;
   (i) Fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders; or
   (ii) Fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders.

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by his is due to him owing to the occurrence of one or both of the two conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date 135 days after the deadline for submission of bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer; notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the bank not later than the above date.

Date_____Signature of the Bank _____

Witness_____Seal _____

_____